

THE ECONOMIC BOTANY OF INDIA

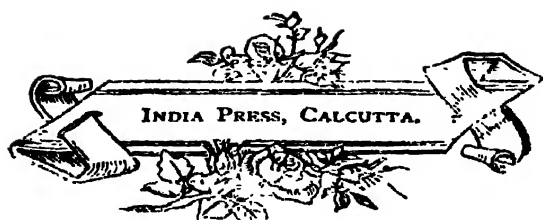
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If we could open and unbind our eye,
We all, like Moses, should espy,
Even in a bush the radiant Deity.

* * * *

Upon the flowers of heaven we wondering gaze,
The stars of earth no wonder in us raise,
Yet these perhaps do more than they
The human lives about us sway.

PREFACE

In this short treatise dealing with the applications and industrial (especially medicinal) uses of Indian plants I have endeavoured to suggest and discuss some of the lines that may be profitably taken up in our present economic situation. The problem of independent livelihood has been assuming larger proportions, and nobody can deny that it is on the solution of this that the success of our national activity in all directions depends. We have, in fact, reached the limit of our resources : until and unless there is a considerable increase in the sumtotal of our material capital, our enterprises and movements in literature and science as in education and industries are likely to be jeopardised. There has necessarily been a constantly growing cry for the opening up of new careers in Commerce, Banking and Scientific and Technical professions.

In response to this demand for new openings, people have of late been suggesting and trying unexplored fields, and considerable national energy has been devoted to the discovery of the possible lines of economic advancement. Industrial success, however, is not to be an accomplished fact with the mere suggestion of Industrial careers. It depends on a number of social conditions, both intellectual and moral, which are of slow and gradual growth. The story of the building up of an industry is the story of all developments ; and economic

movement, like other movements in human society, must pass through the initial and intermediate stages before they are crowned with success. We may look upon all human endeavours as presenting the nature of a moral *series* of the Arithmetical or Geometrical order, of which every succeeding term is an improvement upon the one just preceding.

We have been conscious enough of our need to just commence our race, and are at present really at the first terms of our industrial series which will work itself out and evolve its real character in time. Commercial credit, the faculty of organisation which can make the best use of the *things*, as well as place each *man* in his proper position in some concern, and business capacity which is always in command of capital—in short, those socio-economic virtues that constitute Industrial Morality are very imperfectly developed in us ; and our education is not sufficiently scientific and technical to keep our intellect alive to the industrial possibilities of our country and the broad economic forces that sway the modern world. As a consequence, our efforts in the direction of the material developments of our country must bear the stamp of weakness and tentativeness which characterise the initial stages of all movements.

The process in every country must be the same. In the first place, the Industries have to be started, new commercial lines have to be worked, improved methods have to be introduced ; for it is the undertaking of actual business that is the real schooling for business ability,

and develops commercial morality and intelligence. But from the nature of the case, these are to be regarded as mere experiments which have very little chance of proving successful owing to want of technical knowledge and business habits. Yet these are necessary for national experience, and what are individual losses or wastes become ultimately the pillars of national success.

In the second place, arrangements for manual training and scientific, commercial and technical education have to be made. Here, again, from the nature of the case one cannot hope for success ; for there can be no demand for industrial Education in a country in which there are few industrial fields. Technical and Scientific Education act upon Industrial and Commercial Development and is in turn acted on by it. So that Schools of Commerce, Business Academies, Technical Institutes cannot be successful in an economically young country ; but yet they have to be kept up by the community as experimental seminaries for diffusion of scientific and commercial knowledge.

In the third place, every community which is just entering on the threshold of a new industrial and commercial life must, in addition to the tentative efforts towards the development of industries and the organisation of Industrial Education, try to profit by other people's experience and learn what they have to teach. And for this, attempts have to be made for training competent scholars in foreign schools, and receiving the advice of foreign experts as teachers,

organisers or managers of the home schools and factories. For, how otherwise can any infant community have a supply of the men who are to take charge of the newly started industries and educational institutions? But here, again, as in the other cases, we have to face disappointments and failures, for mere Technical Intelligence on the part of teachers and organisers is not the only thing that is to be counted upon for industrial success. Capital which seeks only the best investments cannot be attracted to them who have yet to prove their ability. They cannot command the confidence and enjoy the 'credit' of the society which necessarily does not meet them half-way; for there can be no economic relations between the experts and the laymen so long as the business intelligence and technical skill are confined only within the small circle of a few scholars and experts who can be counted at finger's ends, and are not sufficiently diffused among, at any rate, the enlightened sections of the community. As a consequence, Capital must fight shy of new and untried fields; and these concerns are sure to remain inadequately manned and financed for long.

These are the three possible courses which may be taken together or one by one; and we have seen that the initial stages in any course are not encouraging and do not offer any bright prospects. Hence people who seek careers and are only attracted by hopes of success are not expected to look with favour upon the infant industries or experimental

schools and foreign trained scholars ; and as national enthusiasm cannot last long without sympathy and encouragement, industrial concerns and institutes are sure to be deserted when they appear to be waning, and people become despondent and pessimistic.

The question, therefore, is, how are new careers to be successful? How can secure investments and lucrative professions be built up in a country? There must be men who can afford to endure losses and can ungrudgingly spend their time, energy and money on what they find to be *prima facie* losing concerns. All capital, physical, intellectual as well as moral, is the result of abstinence, and sacrifice ; and so those members of the community who can put off personal gains in the present, discharge a social function by helping in the growth and accumulation of capital which is to be the efficient cause of the things which are useful to the public in the future. Industry, like Religion, has its own martyrs, apostles and missionaries, who devoting themselves wholly to it, can create something out of nothing. It is these men, who not only open up new lines of industrial thought and activity, but also can make them successful inspite of the difficulties and oppositions natural to the initial stages. They feel the responsibility of making their ideas the ideas of the many and the ideal of the community, and of ushering in that stage at which nothing succeeds like success. Alfred the Great's literary and educational efforts in England and Peter the

Great's pioneering work for Russian Industry and commerce are instances of such responsible idealism.

Time has arrived when in the future interests of the people at large our financial resources have to be lavishly spent, on the principle of the Paternal Government, to investigate into the industrial and commercial possibilities of our community by organising academies, institutes, farms and research colleges, and by employing the best available men as scholars, organisers and experts. We are in need of educational, industrial and financial missionaries who can, without hope of success or the gratification of personal interests apply their skill, intelligence and money to what are at present thankless tasks and seem to be mere wastes.

In conclusion, I have to acknowledge my indebtedness to my friends and colleagues Babu Radhakumud Mukerji M. A., Premchand Roychand Scholar, Hem Chunder Professor of Indian History and Economics in the National Council of Education, Bengal, and Babu Benoy Kumar Sarkar, M. A., Lecturer in History and Political Science, Bengal National College, Calcutta, for the valuable suggestions and kind assistance always received from them.

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B. C. CHATTERJI.

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CONTENTS.



CHAPTER I

Close Connection between Plants and Human Life in India

SECTION 1.

Education and actual life of the Indians	...	1-2
--	-----	-----

SECTION 2.

The Several aspects of Indian Applied Botany	...	2-12
--	-----	------

SECTION 3.

A National Loss	12-13
-----------------	-----	-----	-----	-----	-------

CHAPTER II

The Achievements of India in the field of Botanical Science

SECTION 1.

The Necessity of continuing the studies of our ancestors— our intellectual heritage and modern research	...	13-16
--	-----	-------

SECTION 2.

A brief survey of Indian Botany...	16-18
------------------------------------	-----	-----	-------

SECTION 3.

General remarks on Indian Botany—not a distinct science in the strict sense	19-24
--	-----	-----	-----	-----	-------

form the basis of her peculiar pharmaceutical system. And yet the study of this very useful subject—the physical backbone of our social organisation, the basis of our health and wealth—is grossly neglected and even ignored by our students, because they do not find it sufficiently paying, because there are before them no inviting Botanical and allied professions.

SECTION 2.

THE SEVERAL ASPECTS OF INDIAN APPLIED BOTANY

(a) BOTANY AND ECONOMIC LIFE.

Reserving for a following chapter a detailed discussion of **Indian National Pharmacy** which is solely built on the indigenous system of Botany, we notice here several other Departments of the Applied Botany of India—the influence of plants on the diverse aspects of Indian life.

In the first place, India is an **agricultural** country ; and more than 70% of the population are tillers of the soil. It goes without saying that she can ill afford to neglect the study of Botany.

Besides, the study of Agriculture is itself a liberal education of a very high order ; for ^v* there is no profession which can compare with Agriculture in the variety of interesting subjects, which more or less may be brought to bear on its development ; Physics, Chemistry,

* *Scientific Foundations of Agriculture* by Samuel Cooke, Late Principal, Poona Engineering College.

Geology, Meteorology, Botany, Entomology, Mensuration, Surveying and Veterinary Science—all lend their quota to the enlightened practitioner of this art. And the country that encourages the development of Scientific Agriculture, may indeed be called enlightened in a true sense." So that the student of Botany can not only find a profitable *employment* in the vast field of agriculture, but in receiving training for the agricultural career, acquires a general culture also. And here we quote the apt suggestion of Cooke on the point "The moneyed and the educated natives of India are given to other occupations, such as Government service, shopkeeping, money-lending etc., and, unfortunately have learnt to look upon agriculture—which is the backbone of all industries, and of prime importance to the annually increasing population of India—as something to be avoided. * Educated men thinking lightly of service are now beginning to turn their attention to Arts and manufactures; and to such we would recommend Agriculture as the least over-done of all arts, and the one to which Natural Science is capable of lending most aid." Horticulture and Floriculture, which to all serious thinkers would no doubt suggest a great future development of India, are, like some other allied branches, only a part of Agriculture; and these too require the knowledge of Botany as imperatively as any other thing for their success.

Besides the direct importance of agriculture as a factor of national wealth, it considerably influences the

manufactures of a country in as much as it supplies the material resources and the necessary raw products to be worked up into finished goods. This is more particularly so in a country like India whose economic resources are mainly the contributions of the vegetable kingdom. To mention only a few among the vast and varied resources we have (1) Timber trees, (2) Wild herbs, tubers etc. used as food by the poor during seasons of scarcity, (3) Ferment and Oil-yielding plants, (5) Fibrous Plants, (6) Vegetable-Dyes and Tans, (7) Gummaceous and Resiniferous plants, (8) Vegetable soaps, (9) Vegetable poison, (10) Plants used for poisoning fish, (11) Fodder, besides what are grown in the vast field of general and medicinal agriculture.

In ancient days **Dyeing** was carried on in India almost to perfection. "The commonly accepted view that the natives of India could not dye Tassar Silk prior to the modern advancements which have been accomplished in Europe, is, however quite incorrect. They have from time immemorial thoroughly understood numerous and complicated methods of applying most, if not all, of their permanent tinctorial re-agents to the silk" (S2062 *Dictionary of the Economic Products of India* by Dr. G. Watt.)

The use of such terms as **वस्त्ररञ्जनी** (i.e. cloth-dyeing) for a synonym of **मञ्जिष्ठा** (*Rubia Cordifolia*) would show the application of plants to industry in those times.

Very unfortunately, however, these indigenous products and the arts in which these were used are fast going out of our memory with great loss to our country. A large number of dyers are thus thrown out of work only to starve—or perhaps, at the best, to follow for their livelihood, other professions which are already overcrowded.

It may be observed here that in order that we may be competent to use the agricultural products as raw-materials for manufactures, and thus contribute to our national wealth by *diversifying the industries* of the country, we want a sufficiently thorough knowledge of Botany in both its theoretical and practical aspects.

(b) **BOTANY AND HINDU RELIGION.**

Not only do the plants play a considerable part in our economic life as supplying the basis of our material wealth, they enter greatly into the daily religious life of the Hindus as supplying the tools, implements, and materials for the thousand and one rites and ceremonies, that make up their social, exoteric Religion. And here again we notice a lamentable lack of Botanical knowledge which alone can make the apparatus of our religious life thorough and complete. By the injunctions of the great Smritis, a large part of the vegetable kingdom is laid under contribution for the performance of *Yajnas* and for various other purposes. Very unfortunately, however, mistakes in the identification of plants occur here, as elsewhere, through various causes. One or two

instances will be sufficient to show the nature of confusion.

In सर्वौषधि we have

मुरामांसी बचा कुष्ठं शैलेयं रजनीद्वयं ।

शठी-चम्पक-मुस्तानि-सर्वौषधिगणः स्मृतः ॥

तिथितत्त्वे रघुनन्दन ।

मुरामांसी of the above extract is wrongly used in almost as many places as I have seen. The highly fragrant मुरा is substituted for anything and everything in the plains.

Now take the case of *Sami*.

निधान-गर्भामिब सागराम्बरां शमीमिवाभ्यन्तरलीनपावकाम् ।

नदीमिवान्तःसलिलां सरस्वतीं नृपः ससत्त्वां महिषोममन्यत ॥

रघुवंशम् ।

शमीलक्ष्मीः शिवा शस्ता मङ्गल्या केशहृत्फला ।

पवित्रपत्रा सवती तुङ्गा शक्तुफलाऽपरा ॥

शमी रोधि शमी भूमिः शमी शनख शङ्करः । कैयदेव

हविः ।—राजनिघण्टु ।

There are two kinds of *Sami* (1) *Acacia Suma*, *Ham* (2) *Proposis Spicigera*, *Linn*, भूशमी and शमी respectively ; but a third kind which is entirely of another family is used as *Sami* in Nepal.

Acacia suma is at any rate nothing better than भूशमी । This is called शांङ्कौटा in Bengal. It is common in Bengal, Behar and the Western Peninsula. This is a

medium-sized tree with white bark and downy branchlets. Spines in pairs in short hooks. The extract Catechu is said to be made from the *heartwood* of this tree. The author of *Raj Nighantu* gives the country name as खैरी and it is so called even now on the Kankan side to which particular part of the country he belonged. The same authority calls the other species शमी in contradistinction to this खैरी । There is however extensive use of this tree both in medicine and in religious ceremonies and it also possesses the characteristic thorns. These facts combined with the reasons adduced below would clearly show that the शमी of the Bengal School is भूशमी and not शमी proper. By this last term I mean something worthy of the name of हविः or अग्निगर्भा शमीरिव (रघुवंशम्) ।

Proposis Spicigera, Linn—This is the true शमी of the Shastras. A moderate-sized deciduous thorny tree found in the arid Zones of the Punjab, Sind, Rajputana, Guzrat, Bundelkhund and the Deccan. The pods, which ripen during and before the rains, contain, when scarcely ripe, a considerable quantity of sweetish farinaceous substance which has the flavour of the fruit of the carobe tree, and are largely consumed in the Punjab etc. Hence we find मधुरं शमीफलं (चरक), तत् फलं खादु । (कौयदेव, राजनिघण्टु) ।

It is worshipped at certain times of the year by the Hindus ; all over India it is sacred. Its worship

is enjoined in the **व्रतराज** to be performed in the *Dasahera* festival, because on this tree the five Pandava Princes hung up their arms. It is worshipped to obtain pardon for sins, success over enemies and the realisation of one's wishes. The dry twigs are employed as *Samidhs* to feed the sacred fire.

The leaf is employed as *patri* in the worship of *Ganapati** ; hence **पवित्रपत्रा** ।

The most characteristic and scientific use of **शमी** is however to be found in its name **हविः** and **अग्निगर्भा** । These names are derived from its use in *yajnas* as **हविः** । Here it should be distinctly understood that the calorific value of the wood or fuel is to be desired more than any thing else ; and we can realise the great insight of the ancient *Rishis* into the nature of things when we consider the following remark : " It is chiefly valued for fuel, as its heating power is great, for which it is extensively consumed in locomotives and steam boats in Sind and the Punjab, a fact that is said to have brought a steady decrease in the area under the tree in certain districts. Good charcoal is also made from the wood " (*Settlement Report*, Montgomery.)

In Rajpootana it is worshipped at certain times of the year, when large crowds of natives form themselves into a procession headed by a Maharaja, Raja or Thakoor of the place and make their way to some parti-

* Lisboa.

cular tree set apart for worship. It is also believed that the tree is a transformation of the Goddess that pleased Rama. We find almost the entire subject matter in ब्रतराज, निर्णयसिन्धु (बिजया दशमौ प्रकरण), and भविष्यपुराण ।

शमी शमयते पापं शमी लोहितकण्ठकी ।

धारिण्यर्जुन बाणानां रामस्य प्रियवादिनी ॥

करिष्यमाणा यात्राया यथाकालं सुगन्धं मया ।

तत्र निर्व्विघ्नकक्षांस्त्वं भव श्रीरामपूजिते ॥ इति

From the above we also find that it has thorns as its name indicates a thorny tree or लोहितकण्ठक ।

From its habitat also it will be found that it is not seen in the moist soil of Bengal. Hence it is quite natural that we in Bengal have definitely settled it as identical with *Acacia Suma* which, as shown, is not strictly "Sami," "agnigarbha".

It is a matter of great regret that the people of Nepal call a totally different tree which has no thorns, as "sami" (शमी) and use that for all such sacred ceremonial fires particularly in the thread ceremony. This is a miserable mistake and is in direct contradiction to the undoubted authorities of the Shastras as well as the established practice of recognised places.

Further, we find—

अर्चकस्य तपोयोगात् अर्चनस्यातिशयनात् ।

आभिरूपाच्च विम्बानां देवः सान्निध्यमुच्छति ।

तिथितत्त्वे रघुनन्दन ।

No religious ceremony can be well performed without the help of the vegetable kingdom. Hence the importance of Botany is confirmed by this too so far as the Hindus are more particularly concerned.

Again, particular things are enjoined by the Shastras, not to be taken on certain days; and owing to the ignorance of things, such rules are often violated. The people are ignorantly doing something which, if properly explained, they would not conscientiously do. For in many cases such religious commands may be traced to simple hygienic principles. In particular communities of certain habits and customs these have been found to hold good (at certain seasons under the influence of certain Planets and Stars); and such knowledge greatly depends upon very long experience. In support of this we may quote the following:

"I have cured many cases of Goiter with Iodine C M, when indicated, giving a powder every night for four nights, after the *moon full and was waning*." *Leaders in Homœopathic Therapeutics* by E. B. Nash, M. D., p. 305).

"I have removed a great many suspicious lumps or tumours in the breasts, some of them of years' standing by giving a dose of *Phytolacca C M*, once a month, during the *wane of the moon*. What has the moon to do with it? I do not know, I cure goiter the same way (but not with *phytolacca*), and was led to that way of administration by a suggestion of Jahr. That some

diseases have their aggravation in certain times of the moon I know, and that certain remedies act better then, I know just as well." (*Leaders in Homœopathic Therapeutics*, p. 385.)

Hence the names **ओषधीशः** = **चन्द्रः**; and **ओषधिपतिः** = **चन्द्र** directly suggested the connection of the moon with the vegetable world and the aggravation of the diseases in certain times of the moon.

Of course, innumerable authorities can be cited from the works of our ancient sages, from works of Medicine Religion, Astrology, Astronomy etc. to the same effect.

कुशाण्डे चार्थहानिः स्याद् वृहत्यां न स्मरेद्धरिम् ।
 बृहशतुः पटोले स्याद्धनहानिश्च मूलके ॥
 कलङ्की जायते बिल्वे तिर्यग्गोनिश्च निम्बके ।
 ताले शरीर-नाशः सगान्धारिकेले च मूर्द्धता ॥
 तुम्बी गोमांसतुल्या सग्रात् कलम्बी गोबधामिका ।
 शिम्बी पापकरी प्रोक्ता पूतिका ब्रह्मघातिका ॥
 बार्त्ताकी सुतहानिः सग्रात् चिररोगी च माषके ।
 महापापकरं मांसं प्रतिपदादिषु क्रमात् ॥ त्रियितम्बे ।

The whole of the above is simply meant in a poetic way to impress upon our mind that a man would injure his health by eating the things prohibited herein. Although the variety of threats pronounced is apparently unreasonable, a little reflection will show that loss of health is the underlying principle of the whole.

(c) BOTANY AND LITERATURE

For a proper appreciation of Indian Poetry also we require a knowledge of the External Characteristics of Plants. We lose half the beauty of passages unless we have a general acquaintance with the specimens of plants and flowers which enter so largely into our Literature of Nature.

नीचैराख्यं गिरिमधिवसेस्तत्र विश्रामहेतोः

त्वत्सम्पत्तात् पुलकितमिव प्रोदपुष्पैः कदम्बैः ॥ मेघदूतम् ।

A person will scarcely understand the beauty of Kalidasa here who has not seen the full-blown flower of *Anthocephalus Cadamba* ; or again take

स पाटलायां गवि तस्थिवांसं धनुर्वरः कोशरिणं ददर्श ।

अधित्यकायामिव धातुमयां लोभद्रुमं सानुमतः प्रफुल्लम् ॥

रघुवंशम् ।

शरीरसादादसमग्रभूषणा सुखेन सालक्ष्यत लोभपाण्डुना ।

तनुप्रकाशेन विचयेतारका प्रभातकल्या शशिनेव शर्ज्जगे ॥

रघुवंशम् ।

Similarly these would certainly require the knowledge of *Symplocus Racemosa* for a due preception of the beauty.

SECTION 3.

A NATIONAL LOSS.

When we remember how great a part Indian plants have played in contributing to the material and spiritual

wealth of India and in influencing Indian life in its manifold aspects ; and when we take into consideration the important place Botany should occupy in every scheme of Liberal Education not only as a particular branch of Physical Science but as the most refreshing and stimulating subject of learning, as it develops the powers of observation in the learner and supplies the necessary scientific trend of mind, we can estimate the loss, both in intellect and material wealth, we have been suffering owing to the neglect of this study. The irony of the situation is that we do not see that the study is the cheapest and least expensive, requiring no specially complicated laboratory, so far as India is concerned. To add to the tragedy, we forget that the study is also the most paying ; for India is *the* country where worldly careers and lucrative professions can be built on the products of the vegetable kingdom alone.

CHAPTER II.

The Achievements of India in the field of Botanical Science.

SECTION I.

THE NECESSITY OF CONTINUING THE STUDIES OF OUR ANCESTORS—OUR INTELLECTUAL HERITAGE AND MODERN RESEARCH.

The question for us to decide is how far it is suitable to gather the knowledge of plants from the ancient writings of the sages, or whether we should begin afresh according to the modern and more developed method and neglect altogether what we had in the past.

The difficulty of research work is well known, and should such labour be bestowed for the renewal of the past knowledge would it be duly repaid ? Perhaps here it would be universally admitted, we have got a duty before us, which though certainly it would be worth doing even from the utilitarian point of view, is to be done for its own sake, “कर्मैवाधिकारस्ते मा फलेषु कदाचन ।”

Besides, we believe the revival of the study of Indian plants along the practical lines of our forefathers with the necessary improvements according to the modern scientific method has its own consequences which our nation cannot afford to lose. We have in them some of the now-forgotten resources of our old national wealth—the Applied Botany of India. Pains-taking researches and life-long labour for generations are certainly necessary to piece together the information that lies scattered through the vast field of Sanskrit, Prakrit and Vernacular Literature from one end of India to the other, and that lies imbedded in the social and religious customs, daily practices and quackeries and juggleries of the vast congeries of Indian population. But they are sure to be very fruitful, as they will discover for us the channels of industry and profession that were worked up in olden days and may be profitably taken up to-day. And educationists whose sole effort in the direction of intellectual culture should be to develop the individuality and original powers of the learner's intellect and to equip him with the training

that can fit him for undertaking investigations for discoveries, cannot over-estimate the importance of giving Indian plants—the facts and phenomena of the Indian vegetable world—the highest place in their scheme of education ; for it is a well-known fact that a living interest can be created only in subjects which are familiar, and a healthy curiosity can arise and start independent lines of thought only in things which have become a part of our life through daily contact and intercourse.

It behoves us, therefore, in the interest of a really fruitful system of Modern Indian Education as well as the indigenous arts and industries of our country, not to speak of continuing, by our own labours on modern methods, the intellectual heritage of our ancestors,—

“ To plough the classic field,
 Intent to find the buried spoil,
 Its wealthy furrows yield,
 Till all is ours, that sages taught,
 That poets sung or heroes wrought.”

We shall thus be in a position to bring to light the knowledge of the past in the various branches, and taking full advantage of them, leave our quota behind us.

Thanks to the great savants of the West, including such great masters as Roxburgh, Hooker, Wallich, Royle and others, the Botany of India has progress-

ed far in modern times nice botanical gardens have been laid out with very valuable herbariums, and museums have been definitely planned and founded through the efforts of the most enlightened and benign Government at Sibpore and Shaharanpur.

SECTION 2.

A BRIEF SURVEY OF INDIAN BOTANY

The knowledge of plants with many of their peculiarities was familiar to the ancient sages of India, and may be traced up to the time of the *Rigveda* in which many plants are mentioned as necessary for the performance of religious ceremonies. The other *Vedas* also mention the use of a large number of plants on similar occasions ; in these and more particularly in the *Atharva Veda* their medicinal virtues are definitely stated.

It appears that the comparatively few plants which they used in such religious ceremonies were very well-known to them and they did not consider it worth while to enter into any minute details consequently the descriptions are very scanty.

The well-known authorities, *Charak* and *Susrut*, contain the properties of lots of plants ; and an intimate knowledge of plants is enjoined to all men who would learn medicine.

It appears that a large number of books were written by different authors in which they intended to describe the plants by suitable synonyms that might

point to some botanical, medicinal, geographical, aesthetic or other characteristics. Very unfortunately, however, more descriptive books on the subject seem to have been lost through time. Only a small book named *Dravya Chinha* (द्रव्यचिन्ता) is at present available.

Srikantha and **Dullana** in their commentaries mention लक्षण टिप्पणी a treatise on the description of plants. This does not appear to be extant now.

It may be remarked here that the high calorific value of शमी (*Propolis spicigera*) seems to have been noticed even in the time of Rigveda as it was used in sacerdotal fires even then.

The plants were definitely described by most authorities before *Bhabaprakasha*; and it is in the works of the subsequent period that we find such terms and expressions as कथिता पुत्रदावश्यं लक्षणा मुनिपुङ्गवैः, कथिताः मुनिपुङ्गवैः, चबिकायाः फलं प्राप्तेः कथिता गजपिप्पली etc. The phrases indicating reliance on and appeals to sages unmistakably point to vagueness and indefiniteness of ideas on the subject matter with which the author is not directly conversant. And as it often happens where one is in doubt, he quotes the authority of others particularly if thereby he can successfully appeal to the feeling of the public.

The recovery of the Emperor Shah Jehan's daughter by the treatment of Sir Thomas Roe's nominee

Dr. Boughton—(the first instance of foreign system proving successful in India), the disintegration of the Empire owing to foreign invasions, the Marhatta troubles and internal disorders—all tended to put a barrier to easy communication and intercourse among the students, practitioners and professors of both the art and the science of Botany. And all these had a good share in bringing about the downfall of the Ayurvedic system with a proportionate loss of interest in plants which govern the Pharmacy.

With the progress of the British Government in India a large number of lucrative professions was thrown open to the public. The more powerful European system, being supported by the state and having all the latest methods of modern science to help her, began to make fast progress throughout India. The public, in at least the towns and cities, began to neglect our ancient system which had already been losing all vitality. Most of those who began to study it adopted this profession either because they could not enter the other professions for want of intellect or fund or for some other inconvenience. Of those who took up Sanskrit, most began to learn Hindu Logic or Philosophy; and, thus only the most unintelligent portion of the community, except in very recent times, undertook to study the Ayurvedic system; and of these none could take any interest in restoring the knowledge of plants. Thus the subject from want of first-hand investigation has so much deteriorated in recent times.

SECTION 3.

**GENERAL REMARKS ON INDIAN BOTANY—NOT A
DISTINCT SCIENCE IN THE STRICT SENSE.**

In dealing with the subject of Botany as it was known to the Hindus, it should be, at the very outset, clearly understood that the ancient sages were concerned with the subject only so far as it was necessary to know their practical uses—a practice which makes a study really fruitful and living, and which should be constantly borne in mind by all educationists. As the people had indeed very few wants,

न यातु कामः कामिनां उपभोगेन शम्यति । महाभारत ।

प्रापनात् सर्व्वकामानां परित्यागो विशिष्यते ।

काम्यादि-दोषद्रष्टव्याः कामादि त्याग हेतवः

प्रसिद्धा मोक्ष-शास्त्रेषु तानन्विष्य सुखी भव ॥ पञ्चदशी ।

their practical purposes were also very limited ; and we are to gather our knowledge from these scanty sources. But we shall find that the germs of almost all the ideas that are prevalent now were present in their times in some way or other, however crude and rudimentary they might have been.

It must, however, be admitted that passing remarks have been profusely made throughout Indian Literature regarding almost all the important branches of Botany *viz.*

- (1) Structural Botany.
- (2) Descriptive and Systematic Botany.

(3) Geographical Botany.

(4) Economic Botany ;

excluding perhaps the only important remaining branch *viz.*, Fossil Botany. It is also a hard fact that nowhere the subject of Botany is treated systematically with anything like precision and exactness of the present day. It is almost unreasonable to expect the detailed niceties of Modern Botany in that ancient period ; but at the same time it must be confessed that perpetual contact with the subject gave a thoroughly good practical knowledge to the bulk of the population.

The distinction of castes helped the people a good way to specialise in the different branches of study, and people were definitely enjoined in the Shastras to go and learn the subject of Botany from the experts. Thus we find in Charak and Susrut—

श्रीषधीर्नामरूपाभ्यां जानन्तेह्यजपा बने ।

अबिपासैव गोपास ये चान्ये बनवासिनः ॥ (चरकः) ।

गोपालास्तापसाव्याधा ये चान्ये बनचारिणः ।

मूलाहारास्य ये तेभ्यो भेषजव्यक्तिविषयते ॥ (सुश्रुतः) ।

आभीर गोपाल पुलिन्दतापसाः ।

पान्यास्तथान्येपिच बन्धुपारगाः ॥

परीक्ष्य तेभ्यो विविधौषधाभिधा ।

रसादि लक्षणाणि ततः प्रयोजयेत् ॥ (भावप्रकाशः) ।

The seeker after knowledge is to learn from the shepherd, cowherd, goat-herd, fowler, the devotee and

hermit in the forest, those living in or having any connection with jungles. He should learn of the plant from them, examine it and *after due enquiry* accept the identification as valid. The fact that these men were likely to talk in Prakrit or in different dialects need not frighten him : that would not deter him in his progress ; as we find—

प्रायो जनाः सन्ति बनेचरास्त

गोपादयः प्राकृतनाम संज्ञाः ।

प्रयोजनार्थं वचन प्रवृत्ति

र्यस्मात् ततः प्राकृतमित्यदोषः ॥ (धन्वन्तरि निघण्टुः) ।

These may excite laughter in moderns—considering that the knowledge one may expect to learn therefrom must be of a very crude nature indeed. But a little reflection would point otherwise, as Dr. George Watt has remarked in his invaluable book, *The Dictionary of the Economic Products of India*. —“ There are, for example, numerous forms of *Datura* known to the native expert that would be utterly unrecognisable in the herbariums, like the form of *Aconitum Napullas*, some of these are poisonous and others comparatively innocuous. The shepherd will dig up and eat one form of Aconite but eschew another, recognising it as a virulent poison. But to the Botanist they are undistinguishable. This same knowledge is prevalent regarding the form of *datura*. That we should longer remain entirely ignorant of these facts is doubly to be regretted since we are alike unable to check criminal abuse and to take

full advantage of the meritorious forms. It would richly repay any person having the opportunity and leisure to prosecute such researches, to cultivate in India, side by side, *all the forms known to the natives*; and having critically examined and described these, to have them subjected to chemical analysis."

Remarks like these, coming from such competent authorities, define at once the characteristics as well as the position of Indian Botany in the history of Botanical Science. The fact that for the identification of the plants, we have to go to the professional men and those whose occupations force upon them a life in the forests, and the fact that it is not possible to differentiate specimens by general botanical terms alone except by chemical analysis or acquaintance with their properties (such as may be common to those who have to make constant use of them)—demonstrate the extremely practical nature of the study, to which our ancestors did not scruple to sacrifice the theoretical generalisations of a pure, abstract science. And we should hence look upon their achievements not as mere quackeries or the accidentally-hit-upon truths of mere empirics, but as the results of research of investigators; who, however, were not careful enough to differentiate Science from Art on the principle of the Scientific Division of Labour, and who regarded all knowledge from the practical, human and social point of view, as the *means* of satisfying the needs and performing the duties of life.

In fact, this characteristic of Indian Culture, that it was essentially practical, meant for and adapted to the thousand and one duties of actual life, has made it always very comprehensive, all-embracing, and all-inclusive. Every *Sastra* or *Purana* or *Samhita* has thus become an Encyclopædia, the Synthetic science of all sciences on the principle of the unity and correlation of all knowledges that was recognised and acted upon by Comte and his followers; and as in the physical, so in the human sciences, we search in vain for the differentiation of knowledge into various branches corresponding to the various aspects of human life. We have no Indian Psychology, Indian Ethics, Indian Politics just as we have no Indian Physics, Indian Chemistry, Indian Botany, and so forth, as independent and distinct branches of learning, differentiated from the treatises on universal knowledge.

Indian Botany, then, suffers from these limitations as a theoretical science, *vis.*, that its scope was not rigidly defined, and its nature and exact relations with other sciences were not carefully treated. European Botany, on the other hand, has had a far different history. Having its rude beginnings in the incomplete and unsystematic attempts of Aristotle, Theophrastus and their philosophical successors, who built their science on very meagre materials derived from popular superstitions and medical recipes, the study of Botany, like that of all other sciences, after a chequered career during the Middle Ages, began, with the Renaissance and the Revival of Learn-

ing, to be relegated to a special class of scholars. Not only were the main branches of learning divided among specialists for exclusive study ; but each of the various departments of the same branch began to enlist on its behalf the whole time and energy of special sections of the devoted men of science. Add to this the intellectual energy of Europe that became multiplied by being divided and differentiated for the furtherance of national interests and promotion of national glory (owing to the creation of national churches, national states, national literatures and national schools), and we may form an idea of the enormous labour that has been ungrudgingly spent upon what is to-day a vast Botanical science which, again, is being split up into independent sciences distinct from one another.

SECTION 4.

THE CONTRIBUTIONS OF INDIAN BOTANY.

We have formed a *historical* and *relative* estimate of the work of our ancestors from a consideration of the special sets of circumstances that influenced the study of Botany in India and Europe—the conception of knowledge as well as the intellectual (and general sociological) environment in the two worlds. But Indian Botany has claims to our recognition on *absolute* grounds as well, as having suggested, recognised or discovered some truths about vegetable-life which are accepted by modern Phytotomy and Physiology. We proceed, therefore, to a consideration of the contributions of Indian

Botanists to each of the several branches into which Botanical science is divided by modern scientists; and here, again, we are to remember that we cannot base our remarks on single text-books of specialists but that we have to glean apt phrases or passages from miscellaneous authors in illustration of our point.

(a) VEGETABLE MORPHOLOGY.

I. **Internal Morphology**—Of this we have got very little. The microscope which plays such an important part in the development of this branch of study was not available; consequently only such things were related, as were, on the face, evident—for example, in describing गुड़ूची (*Tinospora Cordifolia*) we have चक्राङ्गी, कुण्डली, मण्डली, चक्रलक्षिका all referring to the annular rings so prominent in the cross-section or transverse section of the creeper.

II. **External Morphology**—Nothing definite about the forms of plants has been stated. The relations of symmetry, the development and origin of shoots seem to have been only very vaguely understood; but these are not left out of account. We have a good example of their knowledge of the Metamorphosis of foliage leaves in the term कर्कटशृङ्गी which is identified with *Pistacea Intergerrima* or *Rhus succedanea*. About simple leaf foliage, however, we find only a few characteristic leaves mentioned such as गन्धर्वहस्तकः, पञ्चाङ्गलः, हस्तिकर्णः, करपर्णः.

in speaking of **आखकर्णी** (*Recenus Communis*) **गोकर्णी** (*Ipomœa Reniformis*, *Salvinea Cucullata*,) and so on. All or nearly all the descriptions are given after the animal world ; or at times one plant is compared with one more familiar plant, such as **गोकर्णी**, **पिलुपर्णिका** ; **शुचोमुख** is used to denote lanceolate leaves.

As regards the "adventitious roots" we have got the example of **गुच्छकन्द** or **गुलच्छकन्द** as identical with *Dahlia Variabilis*. In **हस्ताञ्जली** (i.e. joint palms), there is at least one exceedingly nice example of Metamorphosis of roots. In Nepal this is called **हायाञ्जडी** or **करजोडी**, and I had the pleasure to identify it with *Orchis Latifolia*. Similarly many points may be shown to prove that the striking peculiarities were observed by the ancient sages of India.

(b) BOTANICAL PHYSIOLOGY.

It is well known that plants like animals were recognised as living organisms by the Hindus long before the idea did strike many of the civilized nations of to-day.

वनानामपि वृक्षाणामाकाशोऽस्ति न संशयः ।

तेषां पुष्पफलव्यक्तिर्नित्यं समुपपद्यते ॥

उष्णतो ज्ञायते पर्णं त्वक् फलं पुष्पमेव च ।

ज्ञायते शीर्यते चापि स्पर्शस्तेनात्र विद्यते ॥

वायुग्नाग्नि-निर्घोषैः फलं पुष्पं विशीर्यते ।

श्रोत्रेण गृह्यते शब्दस्तस्माच्छृण्वन्ति पादपाः ॥

वल्ली वेष्टयते वृक्षं सर्व्वतश्चैव गच्छति ।
 न ह्यद्रष्टृश्चमार्गोऽस्ति तस्मात् पश्यन्ति पादपाः ॥
 पुन्या पुन्यैस्तथा गन्धेर्धूपैश्च विविधैरपि ।
 अरोगाः पुष्पिताः सन्ति तस्माज्जिब्रन्ति पादपाः ॥
 पादैः सलिल-पानाश्च व्याधीनाश्चापि दर्शनात् ।
 व्याधि-प्रतिक्रियात्वाच्च विद्यते रसनं द्रुमे ॥
 वृक्षेणोत्पलनालेन यथोच्चे^० जलमाददेत् ।
 तथा पवनसंयुक्ताः पादैः पिवति पादपः ॥
 सुखदुःखयोश्च ग्रहणात् क्षिन्नस्य च विरोहणात् ।
 जीवं पश्यामि वृक्षाणामचैतन्यं न विद्यते ॥

शान्तिपर्ज, महाभारत ।

The above extract from the *Mahabharata* points unmistakably to the recognition of plants as living organisms, endowed with five senses and other things that mark life, at a time when in Europe there was no Aristotle to compare vegetable with animal life; and certainly suggests the existence in plants of the sap circulation which it was the glory of Harvey to discover in the 17th century.

Nourishment, independent growth, power of movement and reproduction were well known as has been shown in the above extract of *Mahabharat*.

It reflects great credit on those students of plants that they conceived the idea of the sexuality of plants

and the fact that flowers are the organs of sexual reproduction in higher plants,—truths which were first suggested by Rudolf Jacob Camerius towards the close of the 17th century and which have been demonstrated in the 18th and 19th centuries by the studies of Koelreuter, Herbert and Gartner in hybridisation. To express this Sexuality some are even expressly named as such e.g. योनिपुष्प (*Clethra Toriata*), लिङ्गपुष्प (*Nerium odorum*) meaning respectively the female and male—and these together with such terms as वज्रपुष्प menstrual blood of certain type in *Tantra* would lead to the idea that the fact of flower being the genitive organ of the tree was not unfamiliar to them.

The pollen and other parts are marked. That the male cells are developed from the pollen formed in the anthers, and that from the female cells enclosed within the ovules after its union with a male cell from the pollen tube the embryo or rudimentary plant is derived, do not seem to have been understood in any way approaching the definiteness of the present day. But it appears that the function of the flower was supposed to be the same in all cases and the process of metabolism was but very vaguely understood, if understood at all.

Is not exudation of water suggested by रुदन्ती in the following?—

स्याद्रुदन्ती स्रवन्तीया सञ्ज्ञोवन्मृतस्रवा ।

रोमाञ्चिका महामांसो चणपत्री सुधास्रवा ॥ राजनिघण्टुः ।

Cressa critica is identified as रुदन्ती but the exudation of water has not been noticed. Are there hydathodes to press out the water? This all-important point must be decided before the identification of the Sanskrit scholars रुदन्ती can be justly called *cressa critica*.

The phosphorescence of plants was also observed, as suggested in the names and descriptions such as the following

बनेचराणां बनितासखानां दरोगृहोत्सङ्गनिषक्तभासः ।
भवन्ति यत्रौषधयो रजन्यामतैलपूराः सुरत-प्रदीपाः ॥
तां हंसमालाः शरदेव गङ्गांमहौषधिं नक्तमिवात्मभासः ।
स्थिरोपदेशामुपदेशकाले प्रपदिरे प्राक्तनजन्मबिद्याः ॥

कुमारसम्भव ।

ज्योतिष्मती तु कटभी सुवर्णलतिकेति च ।
ज्योतिष्कायाऽग्निभासा च लवणीक्ता च दुर्जरा ॥

धन्वन्तरीनिघण्टुः ।

ज्योतिष्मती खर्णलताऽनलप्रभा ज्योतिर्लता सा कटभी सुपिङ्गला ।
दीप्ता च मेध्या मतिदा च दुर्जरा सरस्वती स्यादमृताकं संख्यया ॥

राजनिघण्टुः ।

Is *Celastrus Paniculatus* fit for the above appellation? I have not seen phosphorescence in this wood. In Nepal उजलि लकड़is are found in abundance, but they are not *Celastrus Paniculatus*

The heliotropic movement of plants was also known as shown by the names आदित्यकान्ता, सूर्यभक्ता, आदित्यशक्ति, सुवर्चता, अर्ककान्ता, अर्कभक्ता, मार्कण्डेयभक्ता, भास्करेष्टा (*Cleome Viscosa, Gynandropsis Pentaphylla.*) This, though no doubt, testifying to the powers of observation, cannot stand any comparison with the researches of Ray, Houss, Senebier and others into the influence of Light on the growth, composition and colours of plants.

The Nyctitropic Movement is marked in the case of *Mimosa Pudica*, the Synonyms for which are अञ्जलि-कारिका (folded palm), नमस्कारि (plant which bows down), सूर्यसङ्कोचपणिका, सङ्कोचनी, लज्जा, लज्जिका, सूर्यलज्जा (which feels bashfulness at touch) all referring to the position assumed on stimulation.

The rejuvenation, separation and multiplication of the individuals which are so essential requisites of reproduction seem to have been well understood so far as is necessary for practical purposes without entering into any detail or niceties of modern science.

Action of Light and Storage of Energy on plants and Photosynthesis. In these subjects the following points are traceable, though in a crude way, in such remote periods as the time of Rig Veda :

1. The chlorophyll bodies, it is well known, can only produce organic substances from Carbonic Acid and water by the help of the vibrations of

light. The chlorophyll apparatus is unable to assimilate in darkness, although all other requirements are present for active assimilation. The vibrations of the ether perceptible as light supply the energy for the decomposition of carbonic acid and the production of carbon. A considerable amount of work has to be done in the assimilation of carbon, and on the potential energy thus stored up the vital processes are mainly dependent.

Even the force exerted by the Steam Engine can be referred to the work of assimilation which was performed by the plants whose remains are burnt in the furnace.

2. It would be natural to suppose that the chemically active rays, the blue and violet, which decompose silver salts and other chemical compounds would also be the most effective in promoting the assimilatory activities of the chlorophyll bodies. Exactly the contrary, however, is known to be the case. The highly refractive chemical rays have little or no effect on assimilation ; the red, orange and yellow rays, that is, the so-called illuminating rays of the spectrum, are, on the contrary, the most active. (Page 216 *Text Book of Botany* by Strasburger, cf Pfeffer P-f Physiology 2nd. Edition, Vol I. Art. 60).

These two points, (1) the assimilation of potential energy from the sun and (2) the special suitability of the red, orange and yellow rays for the more effective assimilation of plants *i. e.* for the storage of energy in the potential form are definitely suggested in the following :—

अपस्वग्ने सधिष्टव सौषधीरनु रुध्यसे गर्भे सञ्जायसे पुनः ।

(ऋक्—८ । ४३ । ८) ।

त्वं अग्ने बिम्बे अमृतासो अद्भुह आसादेवा हविरदन्त्याहुतम् ।

त्वयामर्त्तासः स्वदन्त आसुतिं त्वं गर्भो बौरुधां जज्ञिषे शुचिः ॥

(ऋक् २ । १ । १४) ।

अम् ऋषधिषुच तेजोनिधाय रबिरस्त्वं यातीति आगमः ।

मस्तिनाय ।

दिनाम्ने निहितं तेजः सावित्रेव हुताशनः ।

रघुवंशम् ।

The first of these is clearly stated in the above by the terms “गर्भे सञ्जायसे पुनः” “त्वं गर्भो बौरुधां” and the whole of the last texts, which further show that the sun is the source of the energy in the fuel and that it is the setting sun i. e. having the less refractive rays whence the तेजः or energy is transformed and kept in the potential form in the fuel, and this potential energy is manifested as fire or heat.

The Theory of Evolution has been described in the following—

1. तस्मादात्मनः आकाशः सञ्जायत । आकाशात् वायुः वायोरग्निः
अग्नेरायः अद्भ्यः पृथिवी, पृथिव्याओषधयः ओषधिभ्योऽन्नं
अन्नात् रेतः रेतात् पुंशुषः ।

छान्दोग्योपनिषत् ।

2. स्याद्वरं विंशतेलक्षं जलजं नवलक्षकं ।
 कूर्माश्च नवलक्षं च दशलक्षं च पक्षिणः ॥
 त्रिंशलक्षं पशूनाश्च चतुर्लक्षं च वानराः ।
 ततो मनुष्यतां प्राप्य ततकर्माणि साधयेत् ॥
 एतेषु भ्रमणं कृत्वा द्विजत्वमुपजायते ।
 सर्वयोनिं परित्यज्य ब्रह्मयोनिं मतोऽभ्यगात् ॥

बृहद्विष्णुपुराण ।

In the *Brihatvishnu Purana* an attempt has been made to give the successive stages of development of man to even *Brahmayoni*, the highest form of existence. The phylogenetic and ontogenetic developments are laid down, as well as the comparative duration of the stages. The successive number of stages would indeed be visible only after thousands of years of persistent scientific observation of a race of Darwins.

Two things should be further noticed in the text of *Brihatvishnu Purana*. First, that aquatic life precedes the monkey life, and the monkey is the progenitor of man. Again the descent of man from some aquatic animal, although by a remote degree, is grasped with equal acuteness. These ideas are, so far as I have been able to ascertain, exclusively attributed to Darwin ; and our countrymen are scarcely aware of the fact that the truths did not fail to strike the savants of ancient India.

Vidyapati has given the order from the highest to successive lower stages.

किए मानुष पशु पाखी भये जनमिये ।

अथवा कीट पतङ्ग ॥

करम बिपाक गतागत पुन पुन ।

मतिरङ्ग तुया पर सङ्ग ॥

That Indian literature should contain such a full account of the evolution of the animal kingdom from the vegetable world, which could be seen only by a Darwin or a Heckel in such recent dates as the 19th century, ought to inspire thoughtful Indians with a noble vanity, and should infuse into our countrymen a spirit of research with a view to finding out the truths in our Sastras.

“The idea of gradual evolution of higher organisms from lower was familiar to the Greek philosophers, but a scientific basis was given to this hypothesis in the last century” (Strasburger). Is it not our duty to demonstrate to the world that the Hindu Sages conceived the idea long before it was dreamt of by any other nation in the world, and as such, their names should precede the names of any other philosophers? Had the commentators been as acute in explaining these texts, Darwin might have been anticipated in our country long before his name could be heard in the world; or is it that some such commentators lie unnoticed in the dark caves of the Himalayas?—“Some mute inglorious Milton here may rest.”

In all the above, however, I would only remark that these truths of Botanical Physiology were

known to the Hindus simply *as facts*, but no trace has been found out as yet regarding their knowledge of the "science" of physiology as 'to *how* these take place in nature; in short, they have observed the facts without caring to 'explain' them or *assign reasons*. And here, again, as in so many other things, we have to continue, by our specialised efforts, the work of our ancestors, and develop them along the proper lines, just as the European scholars of the 17th, 18th and 19th centuries have, by their own labours, improved upon, and added to, the heritage bequeathed by their ancestors of the classic age.

(c) SYSTEMATIC BOTANY

In the matter of classification nothing approaching the keen observation and generalisation of modern times is to be found. One peculiarity has not been traced through a sufficiently large number of plants, and we find only isolated instances of two or three plants classified under one group. Thus, सरल (*Pinus Longifolia*) and देवदारु (*Pinus Deodara*) are placed in one group, *i.e.*, one is described just after the other in *Madanpala Nighantu*, and such instances are found in abundance in all the authors. चिलगोजा or निकीचक (*Pinus Gerardne*) could have also been placed in the same group, but instead of mentioning it here it is named along with अचोड़क (*Juglans Regia*,) etc.

The basis of classification is the property of the things ; e.g. in चन्दनादिबर्ग^१ all sweet scented things such as Sandal wood are mentioned and in शाकबर्ग^२ all vegetables. In these, however, further subdivisions are made and here we find some more systematic arrangement, as all कर्कोरु, (*Cucurbita papo*), कुपाण्ड (*Benincasa Cerifera*) etc. are grouped together. When one thing has more than one property it is grouped to bring out, as in *Cucurbitacea*, the most prominent characteristic, the whole being adjusted to the convenience of a practical man.

खदिर (*Acacia Catechu*), रक्तखदिर (*Acacia Sundria*, D.C.), श्वेतखदिर, बिट्खदिर (*A. Farnesiana*) and चरि (*A. Pennata*) are all put together in Dhanantari and in Rajnighantu in शास्त्रलोबर्ग^३ which is based on the common possession of thorns. Again, many of the things in *Cucurbitacea* have been placed together most possibly for similarity of the fruit. पाषाणभेद, बटपत्री, श्वेतशिला, चतुष्पत्री in *Saxafraga* and निम्ब (*Melia Azadirach*), महानिम्ब (*Melia Azeddaruck*) कैडर्य (*Alianthus excelsa*), Roxb, of the *Meliaceæ* order have been placed together for the similarity of the bitterness of the principle in flowers, fruits and leaves. Things producing bulbs are sometimes placed together: so in short any quality, or peculiarity has been taken and plants divided into various artificial groups.

The above will substantiate the view that under each वर्ग^o or principal group the members of the same family have been placed together, these so often possessing many properties in common.

The identifying principle accepted by the Indian Botanists depends upon a large number of facts such as (1) locality, which touches upon Geographical Botany, (2) description of the plant by comparison of its leaves, flowers, roots, fruit, branch, juice, colour, smell and property etc. with some other known things. These things are so given that in most cases all the connotations of one are not found in any other, but very unfortunately, in many cases the synonyms are highly perplexing indeed.

One instance will be sufficient here to show the difficulty. 'आखुकर्णी' (*Salvania cucullata*) and द्रवन्तो (*Ipomæa Reniformis*) are thus described *Ipomæa Reniformis* :

द्रवन्तो शम्बरौ चित्रा न्यग्रोधा मूषिकाद्वया ।

प्रत्येकत्रेणी विषा चण्डा पुत्रत्रेन्याखुकर्णीका ॥

धन्वन्तरौ निर्घण्टः ॥

द्रवन्तो शम्बरौ चित्रा न्यग्रोधी शतमूलिका ।

प्रत्येकत्रेणी विषा चण्डा पुत्रत्रेन्याखुकर्णीका ॥

मूषिकाद्वयिका कर्णी प्रतिपर्णीश्लिषा चसा ।

सहस्रमूली विश्रान्ता त्रया स्याच्चतुरेकधा ॥

राजनिघण्टः ।

Salvania Cucullata :

स्वादाक्षुकर्णो कषिका द्रवन्ती चित्रा सुकर्णुन्दुरुकर्णिका ।
 मधोधिका मूष्कनाम कर्णी स्याद्वृषिकर्णी बहु कर्णिकाश्च ॥
 माता भूमिचरी चण्डा शम्बरौ बहुपादिका ।
 प्रत्यक्षेणी वृषा चैव पुत्रश्चेत्यद्रिभूद्वया ॥ राजनिघण्टुः ।

The comparison will show the synonyms, and the description of one will be seen to be a mere repetition of the other. The local name is also मूष्काकाणी for both. The properties, however, in one are different from those in the other, fortunately these are observed in local usages. Hence, the one can be distinguished from the other simply by taking advantage of the properties and nothing else.

Such synonyms recur in many places, and we find the following rule for identification

नानाभिधेय मथ यत्र गिवा समङ्गा ।

श्यामादि नाम निगमेषु निवेदितं यत् ॥

प्रस्तावबोध्यं रसयोग वसादमुच्य ।

बुध्वा विमृश्य भिषजाश्च धृतिर्विधेया ॥ राजनिघण्टुः ।

In many cases, however, the descriptions are quite characteristic as in हस्ताक्षली e. g. *Orchis Latifolia*, which is thus described ;

हस्तपर्याय पूर्वस्तु जोड़िवैद्यवरै स्मृतः ।

करजोड़िरिति ख्यातो रसबन्धादि वैश्रण्ट्यत् ॥ राजनिघण्टुः ।

In this, instead of speaking of any of its peculiarities the specialist just compares it with the folded palm of the hand which will at once identify it and differentiate it from the rest of the vegetable world.

From the terms used in the slokas as synonyms we get the entire clue to the identification of the plants : A negligence in thoroughly examining these terms has led to the disastrous mistakes which have detracted half the merit of our well-tried system of medicine.

The classifications adopted in Charak in describing पञ्चाशत्सहस्रकषयाः and in Susrut in सप्तविंशद्गुणाः are based purely upon the properties of plants, consequently these involve the repetition of one plant in different places. Of the same plant possessing several properties, for instance, यक्ष्मीमधु (*Glycyrrhiza Glabra*, *Liquorice* root) mention has been made in connection with

1. जीवनीयानि (medicines which prolong life.)
2. सन्धानीयानि (medicines which promote the union of fractured or divided parts)
3. बर्णानि (medicines which improve the complexion)
4. कण्ठगानि (medicines which improve the voice.)
5. कण्ठुघ्नानि (medicines which cure pruritus.)
6. क्षर्दिनिग्रहणानि (medicines which relieve vomiting.)
7. पुरीषविरजनीयानि (medicines which alter the colour of the faeces.)

8. **मुत्रविरजनीयानि** (medicines which alter the colour of urine.)

In each of these groupings there are ten plants mentioned. So there is a *cross division* in many cases.

In *Susrut* also we find similar classification according to properties of matter. Other treatises on Medicine also group them according to certain peculiarities, and each grouping is fantastically named according to certain distinguished member of the group. For example we find in *Dhanantari Nighantu*—गुडूच्यादिवर्गः, शताम्नादिवर्गः, पपंटादिवर्गः, पिप्पल्यादिवर्गः, मूलकादिवर्गः, शाक्यादिवर्गः, प्रमद्वादिवर्गः, करवीरादिवर्गः, आम्रादिवर्गः, चन्दनादिवर्गः; in *Madanpal Nighantu* अभयादिवर्गः, शण्डादिवर्गः, कर्पूरप्रभृतिसुसन्धिद्रव्यवर्गः, वटादिवर्गः, फलादिवर्गः, शाक्यवर्गः, इक्षुवर्गः, धान्यवर्गः; in *Bhabaprakash* हरितक्यादिवर्गः, गुडूच्यादिवर्गः, पुष्पवर्गः, वटादिवर्गः, आम्रादिफलवर्गः ।

It would thus appear that the Indian system of classification does not accurately correspond to the classification into Natural Orders which has been founded under the influence of the Dogma of the Constancy of Species during the period from 1750 to 1850, and under that of the study of the Cryptogams in the latter half of the 19th century. It differs widely from the artificial classifications of Brunfels, Fuchs, and other Botanists of Germany and Netherlands who flourished in the 16th century or of Cisalpino the Italian Botanist of the same century

who attempted to divide plants into groups by philosophical reflection. While *mainly artificial*, the Indian System may be compared not to that of Linnæus, but of Jussieu who based it on properties. And for all practical purposes, whatever may be said against its scientific value, a system based on properties was more useful than the systems of the early European Botanists, which, according to Sachs, were too vague and insufficient for identification.

CHAPTER III.

Indian Medical and Pharmaceutical Botany.

We have remarked that Indian Botany, whatever may be said of its merits as a theoretical Science both from the *historical* and *absolute* standpoints, was at any rate perfectly well-developed so far as we are concerned with the knowledge of the uses to which the plants can be put. We have referred to agriculture, dyeing as well as several other industries which require a knowledge of Botany. We proceed next to consider one other aspect of the Industrial and Economic Botany of India *vis.* Indian Pharmacopœia, which differs from other Pharmaceutical systems in being mainly Botanical.

SECTION I.

THE RELATIVITY OF MEDICAL SCIENCES.

The Doctrine of the Influence of the Environment on living matter and its adaptation to it is one of the most fundamental contributions of modern Biology, and the

facts that the food products of a country are directly related to its physical features, and necessarily the health, strength and efficiency of population are intimately connected with the sum total of those factors and agencies that go to make up the land they live in, are common place truisms which hardly require any explanation. In fact, this dependence of health and vigour on the External Surroundings, and the relativity of hygienic systems to climatological conditions is only one aspect of the more general fact of the dependence of History on Geography as its physical basis. The consequence is that as in social, economic and political, so in medical institutions we have to recognise the same Relativity to the Environment. Each country has thus its own economic system, its own political system and its own medical system which are necessarily radically different from the corresponding systems of other countries.

Not to speak then, of the general sociological and intellectual forces that exercise a powerful influence on the human institutions, the very fact that India occupies a certain place in the terrestrial and solar system with fixed relations to the physical and natural agencies of the universe tends to give her a special hygienic and medical system with its peculiar features, which is just adapted to the nature of her children and adjusted to their physical requirements. And this *natural* medical system has given rise to theorists and practitioners who have, throughout the ages of Indian

history, contributed, by their studies, researches and experiments, to the development of an Indian *national* medical science that is best calculated to promote the national health and efficiency. The existence of a national medical science which has supplied the needs of the people fills us with a just pride in the intellectual and practical achievements of our ancestors, and it surely supplies us with the most important condition of our self-sufficiency so far as medical aid and hygienic knowledge are concerned

SECTION 2.

THE AYURVEDIC METHOD OF THE TREATMENT OF DISEASES.

The Ayurvedic System is the most ancient system on record and it dates since the time of *Atharva Veda*. According to *Susrut* Ayurveda has been taken as इह खल्वायुर्वेदो नाम यदुपाङ्गमथर्व वेदस्यानुत्पाद्येव प्रजाः श्लोकं शतसहस्रमध्यायसहस्रञ्च कृतवान् स्वयम्भूः । आयुरस्मिन् विद्यतेऽग्निर्वा आयुर्विन्दतीत्यायुर्वेदः । सुश्रुतः ।

अष्टादश विद्यान्तर्गतं धन्वन्तरि प्रणोत विद्याविशेषः ।

शब्दकल्पद्रुमः ।

The healing art or Ayurvedic system of the Hindus has, in common with all other similar systems, the same object of curing diseases and preservation of health. The object has thus been stated by *Susrut* : इह खल्वायुर्वेदं प्रयोजनं व्याध्युपसृष्टानां व्याधिपरिमोक्षः स्वस्थस्य रक्षणञ्च । सुश्रुतः ।

व्याधिस्तस्य परिज्ञानम् वेदनायाश्चनियमः ।

एतत् वैद्यस्य वैद्यत्वं न वेदः प्रभुरायुषः ॥

भावप्रकाशः ।

"The great works of *Charak* and *Susrut* were translated into Arabic, under the patronage of 'Caliph' Al Mansur, in the seventh century. The Arabic Version of *Susrut* is known by the name of "Kelale Shaw shoore-al-Hindi" These translations in their turn were rendered into Latin. The Latin Versions formed the basis of European medicines which remained indebted 'to the Eastern Science of medicine down to the 17th century." (*History of the Aryan Medical Science*, p 196, by Thakur Sahib of Gondal).

The peculiar system of the Hindu pathology and diagnosis of diseases has been very beautifully expressed in the famous book named *Madhava Nidana*. It was written by Madhab Kar in the eighth century of the Christian era, and Professor Wilson is of opinion that this book was translated into Arabic and often referred to by the Mahomedan doctors. Besides this, there are also a host of books dealing with the same subject. The *Chakradatta Sangraha* is another well known treatise on pathology and therapeutics written in the twelfth century.

This system lies at the root of all modern systems, the Allopathic and other systems of medicine.

In the domain of practical therapeutics this fully recognises the principles of "*contraria contrariis*" of the hypothesis-framer Galen and "*Similia Similibus Curentur*" of Dr. Hahnemann as shown below.

हेतु बगधि-विपर्यस्त-विपर्यस्तार्थ-कारिणाम् ।

औषधान्न-विहारानामनुपयोग-सुखोपहृम् ॥

माधवनिदान ।

औषधं यथा :—अग्निपुष्टे उष्णोर्ब्बादिप्लु लेपः । विषे वा विषं ।

अन्नं यथा :—मद्यपानोत्थं मदातृये मदकारकं मदं ।

विहारो यथा :—व्यायामजनितं संभूतवाते जलप्रतरणरूप व्यायामम्
छर्द्दिषु बह्वदोषासु छर्द्दणं हितमुच्यते । सुश्रुतः ।

अशुद्धं गन्धः कुरुते तु तापं कुष्ठं भ्रमं पित्तकृजां करोति ।

रूपं बलं बौर्यसुखं निहन्ति तस्मात् सुशुद्धो विनियोजनीयः ॥

शुद्धगन्धहरद्रोगान् कुष्ठमृत्युं ज्वरादिकान् ।

अग्निकरि महानुष्णो बौर्यवृद्धिं करोति च ॥

अशुद्धतालंमायुष्मन् कफमारुतं मेहकात् ।

तापं प्फोटान्नसंकोचान् कुरुते तेन शोधयेत् ॥

हरितालं कटुं सिद्धं कषायञ्च विषर्पणुत ।

तालकं हरते रोगान् कुष्ठं मृत्युं ज्वरादिकान् ।

सशुद्धं कान्ति बौर्योजः कुरुते मृत्युं नाशनं ॥

रसेन्द्रसारसंग्रहः ।

Similarly many instances may be cited about a thing producing a certain disease which when applied in a special way would cure the same disease.

After comparing these with the instances of involuntary Homœopathic cure in Old School practice (vide articles 206—237 Appendix of *Organon of Medicine* by Samuel Hahnemann translated by R. E. Dudgeon, 2nd American Edition) should it not occur that in all these cases "*Similia Similibus curentur*" of Hahnemann is suggested to the medical profession ?

Besides, Susrut strongly recommends the value of Psychopathy, in those forms of mental or nervous distempers, which has been the glory of Mesmer in modern times. And the आवेश or autohypnotism and

समाधि or the higher phases of clairvoyance are experiences of every day occurrence in the miracles of Jogis and Shadhus of India who are sometimes successfully followed by men of far less respectability of character.

The system is divided into eight parts, e.g., शल्य, शालक्यं, कायचिकित्सा, भूतविद्या, कौमारभृत्यमगदतन्त्रं, रसायन तन्त्रं, वाजोकरण तन्त्रमिति ; (सुश्रुतः) thus including anatomy, surgery and treatment of various kinds of diseases, poisons, use of tonic, approdisiac and other medicines used for the preservation of health.

Surgery and allied branches have been highly praised and described with a scientific precision which

might be a glory to any age. We have the following in the words of Dhanvantari himself as described by Susrut :

अहं हि धन्वन्तरि रादिदेवो ।
जराकृजा मृत्युहरोऽमरानाम ॥
शल्यङ्गमङ्गै रपरैरुपेतम् ।
प्राप्तोऽस्मि गां भूय ब्रह्मोपदेष्टुम् ॥

सुश्रुतः ।

यश्चिन्त्याममज्ञानाद्यो वा पक्षमुपेक्षते ।
श्वपचारिव मन्तव्यो तावन्निश्चितकारिणो ॥
आमं विदह्यमानं च सम्यक् पक्वं च यो भिषक् ।
जानोयात् स भवेद्द्वैद्यः शेषास्तस्करवृत्तयः ॥

माधवनिदाने ।

अष्टास्वपि चायुर्वेदतन्त्रेष्वतदेवाधिकमभिमतमाश्रित्या-
करणादयन्त्र-शस्त्र-क्षाराग्निप्रणिधानात् सर्व्वतन्त्रसामान्याच्च,
तदिदं शाश्वतं पुण्यं स्वर्गं यशस्यमायुथं वृत्तिकरश्चेति ॥

तत्र शल्यं नाम विविधद्वण-काष्ठ-पाषाण-पांशु-
लोह-लोष्ट्रास्थि-वाल-नख-पूयास्त्रावान्तगर्भशल्योद्धरणार्थयन्त्रशस्त्र
क्षाराग्नि प्रणिधानव्रणविनिश्चयार्थञ्च । सुश्रुतसंहितायां ।

“The subject of मूढगर्भ and अश्लरी which relate to difficult delivery and operation of stone are treated in so masterly a manner that Dr. Charles desired to see them. Dr. Charles, after perusal of the description, highly

praised the process of delivery in difficult cases and even confessed that with all his great experience in midwifery and surgery he never had any idea of the like being found in all the medical works that came under his observation." (*Vaidvaka Sabda Sindhu*)

Plastic and Rhinoplastic operations:—In Susrut we find :

एकैव तु भवेत् पालिः स्थूला पृथ्वी स्थिरा च या ।

तां द्विधा पाटयित्वा तु छित्त्वाचोपरि सन्धयेत् ॥

गण्डादुत् पाव्य मांसेन सानबन्धेन जीबता ।

कर्णपालिमपालेस्तु कुर्यान्निलिख्य शास्त्रवित् ॥

सुश्रुतः, सूत्रस्थान षोडशोऽध्यायः ।

Here, in the history of medicine, we find for the first time the grafting or transplanting of sensible skin flaps and thus it is that Doctor Hirschberg of Berlin points out "The whole plastic surgery in Europe took a new flight when these cunning devices of Indian workmen became known to us." And to Susrut again is due all credit of discovering the art of cataract-crouching which was not known to any other civilized nation in the world, specially at such a remote period.

Amputations were extended to major operations, as shown by the use of medicated wines as *anaesthetics*, which were used even in such remote times of Susrut. **Obstetric and Ophthalmic Surgery** have been treated

at length by the same author whose treatment of **Midwifery** is no less wonderful and sound. The knowledge of **Comparative Anatomy** which was practically acquired from **dissection** of dead bodies so strongly advocated by Susrut, and quartered sacrificial animals as shown in ऐतरेय ब्राह्मण was only just natural. Surgery was also similarly practised and this was first tried upon unburnt earthen pots, fruits etc., to get free and easy practice. Dr. Wise observes "The Hindu Philosophers undoubtedly deserve the credit of having, though opposed by strong prejudice, entertained sound and philosophical views respecting the uses of the dead to the living, and were the first scientific and successful cultivators of the most important and essential of all the departments of medical knowledge, **practical anatomy**."

With all these, however, the medical man is advised to have recourse to surgery only when all medicines fail to effect a cure and when the vital force unaided is not sufficiently strong to effect a rupture at the desired part of the body, as we find ;

धातुनाम् व्यापदि यच्च भेषजं नैव सिद्धति ।

ह्यामये दुस्तरे तस्मिन् शस्त्रमेव विधीयते ॥

दशमपटले महानील तन्त्रे ।

The fumigation of the sick-rooms with the vapours of various substances, as shown in Susrut and many other authors, anticipates the *antiseptic theory* of Modern times.

Circulation of Blood:—In **हारितसंहिता** we find about the circulation of blood while the author describes **पाण्डुरोग** or Jaundice or Anæmia and the fact is mentioned also in **Bhabaprakash**—

रक्तं सर्व्वग्ररीरस्थं जीवस्याधारमुत्तमम् ।

स्निग्धं गुरु चलं स्वादु विदग्धं पित्तवद्भवेत् ॥

भावप्रकाशः ।

धातूनां पूरणं सम्यक्स्पर्शज्ञानमसंशयम् ।

स्वरिरासुचरद्रक्तं कुर्याच्चान्यान् गुणानपि ॥

यदातु कुपितं रक्तं सेवते स्ववद्वा सिराः ।

तदास्य विविधा रोगा जायन्ते रक्तसम्भवा ॥

भावप्रकाशः ।

Harita is taken to be older than **Susrut** by many authorities and even **Bhabamisra** is about a century older than **Harvey**. Thus we see that the great glory of **Harvey** was anticipated and definitely formulated a few centuries before the birth of Christ in our country.

The **धात्वग्नौ** of our system, when seen in the modern light, would go a good way to explain for the existence of the Protoplasmic theory of the **Hindu** philosophers.

Our Pathology is good in its own way. "The true healing art is in its nature a science of pure experience and can and must rest on clear facts and on the sensible phenomena pertaining to their sphere of action, for

all the subjects it has to deal with are clearly and satisfactorily cognizable by the senses through experience etc." (*Organon of Medicine* by Samuel Hahnemann. Preface to the 2nd edition.)

Our special system of pathology has done and is doing so admirably with the unique system of medicine and drugs such as oils, ghritas etc. which have been proved by ages of experience to really possess marked therapeutic virtues.

The method of *diagnosis* is also characteristic ; and great perfection seems to have been reached in this direction. The Nadi Bijnan of **Kanad** and *Nadi-prokasha*—a treatise which deals with the arteries, veins and nerves, composed by Sankarasena are some of the many books on the subject. The beating of the pulse indicating the derangement of *Bayu*, *Pitta* and *Kapha*—causing all the diseases, the body is heir to, is taken to signalise all disturbances within. These invaluable books made the Hindu physicians, such great sphygmologist.

As regards the insight of our sages into the nature of things I might only point out that Susrut while enumerating the nature of the utensils in which kings should be given their dishes, at the time of dinner, mentions that while gold, silver, earthen and stone-ware are to be used for various kinds of food, pure cold water for drinking should be given in copper vessel.

वक्ष्यामः परं कृत्स्नामाहारस्योपकल्पनाम् ।

हृतं कार्णायसे देयं पेयादेया तु राजते ॥

फलानि सर्व्वभक्ष्यांश्च प्रदद्याद्दैदलेषु च ।

परिशुष्कं प्रदिग्धानि सौवर्णेषु प्रकल्पयेत् ॥

प्रद्वानि रसांश्चैव राजतेषूपहारयेत् ।

कट्वराणि खडांश्चैव सर्व्वान् शैलेषु दापयेत् ॥

दद्यात् ताम्रमयेपात्रे सुशोतं सुशृतं पयः ।

पानोयं पानकं मद्यं मृगमयेषु प्रदापयेत् ॥

काचस्फटिकपात्रेषु शीतलेषु सुभेषु च ।

दद्याद्दैदूर्य्य पात्रेषु रागषाड् बसट्टकान् ॥

जलपात्रन्तु ताम्रस्य तदाभावे मृदोहितम् ।

पवित्रं शीतलं पात्रं गठितं स्फटिकेन यत् ॥

काचेन रचितन्तद्वत्तथा वैदूर्य्यं सम्भवम् । भावप्रकाशः ।

When we reflect upon this selection of copper for drinking water in contradistinction to the use of so many things known to them and mentioned by them for other purposes in the same connection, and see the extensive use of this metal in all the utensils of our worship and religious life, we can only imagine that the close connection of the hygienic principle on this point was not to them a mere matter of chance—that the power of copper to kill disease germs or bacteria which was observed by Doctor George Thomas Moore, of the

Pathological Laboratory of Plants, in Philadelphia, so late as the year 1904, was not undreamt of by our sages,

Pharmacopœia :—The great pharmacopœia of the Hindus is deduced from (1) The vegetable kingdom (2) The mineral kingdom and (3) The animal kingdom as we find in Susrut “रसाः पुनर्द्रव्याश्चया । द्रव्याणि पुनरोषधयस्त्राद्विविधः स्थावरा जङ्गमाश्च” ।

The knowledge of the dynamisation of drugs of the Hahnemann *i.e.* system have been sufficiently anticipated in प्रभाव and in सहस्रधौतघृत and many oils and ghritas as daily used by the Ayurvedic physicians.

The use of the *Mineral Kingdom* for medicinal purposes, has been ably treated by Dr. P. C. Roy in his History of Hindu Chemistry. We may only remark here that our authorities simply did marvel in the field considering that the analytical and synthetic methods and processes of Modern Chemistry fail to reproduce those chemical products and reagents with the exact physiological and therapeutic effects.

As regards the *Animal Kingdom* we find that from a very remote time it has been utilised for medicinal purposes and many animal products such as Musk, poison of Cobra de-Cappelo and of the snake-eating black cobra. In fact in most books on Therapeutics the properties of the flesh of various kinds of animals have been discussed to nicety. Some of the medicines thus prepared have got wonderful efficacy.

If we turn our attention to the *Vegetable Kingdom*, we find that the great Rishis who organised the system had extensive knowledge of the plants ; and that after having ascertained the peculiar properties of the various drugs they used to get them through the hermits and others who used to spend their lives in the wilderness. They collected their materials from all parts of India and even from outside. Pilgrimage helped them a good way in their studies of the subject. With their wonted zeal and perseverance they carefully verified their efficacious qualities as affecting human system and introduced them into the Medical Science. They, therefore, firmly believed that a thorough knowledge of these drugs formed the most important factor in the attainment of success in Medical Science" (*Vaidyaka Sabdasindhu*).

The following verses give an account of the importance of the study of plants in all their aspects *i.e.* to the would be भिषक्.

योगज्ञस्तस्य रूपज्ञ स्तासां तन्वविदुचरते ।

किं पुनर्यो विजानीयादोषधी सर्व्वथा भिषक् ॥

रूपं तासां तु यो विद्याद्देशकालोपपादितम् ।

पुरुषं पुरुषं वोक्त सविज्ञेयो भौषक् तमः ॥

यथाविषं यथाशस्त्रं यथाग्निरशनियंथा ।

तथौषधमभिज्ञातं विज्ञातममृतं यथा ॥ चरकः ।

भिषग् द्रव्याण्युपस्थाता रोगोपाद चतुष्टयम् । चरकः ।
 बन्धो व्याध्यु पशृष्टश्च भेषजं परिचारकं ।
 एते पादाश्चिकित्सायाः कर्मसाधक हेतवः ॥ सुश्रुतः ।
 रोगमादौ परोक्षेत तदन्तरमौषधम् । माधवनिदानः ।
 पाको नास्ति बिना बीर्याहीर्य्यं नास्ति बिनारसात् ।
 रसो नास्ति बिना द्रव्याद् द्रव्यश्रेष्ठमतः स्मृतम् ॥ सुश्रुतः ।
 यास्तु रोग विशेषज्ञः सर्व्व भेषज्यको विदः ।
 देशकाल विभागज्ञस्तस्य सिद्धिर्ण सशयः ॥
 यस्तु केवल रोगज्ञो भेषजेष्वविचक्षणः ।
 तं बन्धं प्राप्य रोगी स्याद् यथा नौणविकं विणा ॥
 रोगी दूतो भिषग् दीर्घमायुद्रव्यं सुसेवकः ।
 सदीषधं चिकित्साया इत्यङ्गानि बुधा जगुः ॥

भावप्रकाशः ।

So important was Botany considered that a student of medicine was enjoined to learn of the plants from those who were likely to know them—those who lived in the jungles or were in some way concerned with them. He was to go to the Himalayas—"He who thinks of the Himalaya though he should not behold him is greater than him who performs all worship in Kashi" (*Skanda Puran*)" and the Vindhya Hills, in search of the plants. The two places were to supply two different types of

medicine and so the student was commanded to see them. Thus we find in Charak and Sarangadhar.

ओषधीनाम् पराभूमिर्हिमवान् शैलसत्तमः । चरकः ।

आग्न्या बिभ्यर्षलाद्या स्थौम्यो हिमगिरिर्मतः ।

अतस्तदौषधानि स्युः रणुरुपाणि हेतुभिः ॥ शार्ङ्गधरः ।

We have also—

1. जीवकर्षभकौ ज्ञेयौ हिमाद्रिशिखरोद्भवौ ।

भाब्रप्रकाशः ।

2. महामेदाभिदः कन्दो मोराङ्गादौ प्रजायते ।

भाब्रप्रकाशः ।

3. अम्बुवेतसः भोटदेशे प्रसिद्धाः ।

राजनिघण्टुः ।

Passages like these describe at once the place of Botany in the scheme of Hindu Medical Education as well as indicate the vast laboratory of the Indian continent which the student had to use for observation, experiment and collection of specimens.

SECTION 3.

DETERIORATION OF THE PRACTICE IN THE AYURVEDIC SYSTEM.

It will thus have been clear that as a science of the investigation of diseases and an art of the prescription of medicines, Ayurveda can hold its own against any system of medical treatment ; for it is based on

the rock foundations of a knowledge of genuine Hygiene and Pharmacy. We have here to observe that the theory and philosophy of this science and art have been greatly lowered in public estimation owing to the deterioration in the quality of practitioners in the system during comparatively recent times. But this condemnation of the practice, however justified, must not blind us to the real merits of the system as a scientific method for the treatment of diseases.

We have in a previous chapter hinted at some of the imperfections in the writings of authors who, under the cloak of such phrases as refer the readers to the sages, have tried to conceal their ignorance. We intend to discuss here some of the circumstances that may have arrested the proper growth and development of the science, and hampered the practitioners in their work along scientific lines.

In the first place, the necessary conditions for the study of medicine along Ayurvedic lines are very difficult to be realised. The knowledge that is demanded of the student about the chemistry, morphology and external characteristics of plants implies a thorough grounding in Medical Botany. And as the Ayurvedic system was built on investigations into vegetable phenomena extending over the whole country, which is really an epitome of the world, no knowledge of Botany could be complete unless the pupils were thoroughly acquainted with the different aspects of the Botanical Geography of India.

The vastness of the field, put a check to the acquisition of firsthand information and the undertaking of original researches to all but missionaries and *sanyasis*. But all of them are not expected to have come across scholars who wanted to use varied personal experiences for their literary or scientific purposes. And so the sedentary teachers and their pupils have had to go over the beaten paths without contributing anything to the fund of knowledge. Under these circumstances it is not suprising that the practice of the Ayurvedic system should be vitiated by Botanical errors and confusions.

The *most characteristic source* of error is the fact that the people of the plains had a natural tendency to get out every specimen from the plains and within their own locality, if possible ; and those living in the hills were also too much similarly disposed.

The effects of this *mal*-observation added to those of *non*-observation are sufficient to explain a large number of anomalies that present themselves before any observing eye, and many of the mistakes that may be detected with certainty, if a bird's eye view of the entire Hindustan is taken, and this tendency towards the narrowing of horizon and limiting of the field of observation was intensified by the absence of intercourse as well as by the creation of fixed schools.

. As schools began to be founded, books became the chief means of education, and direct observation of facts

had to be replaced by mere inculcation of statements from books. When we see the omission and the wrong identification of a large number of important plants in many of these books we spontaneously think that these were the works of men who have never personally handled the Ayurvedic plants. Nobody in a botanical garden can be expected to give a very sound verdict about a plant growing in a high altitude, unless the plant has been already botanically identified to be so by a competent man. The information of the Bazar is most imperfect, and we should value the books at their best, but we should not forget that "all knowledge which comes from the books comes, indirectly, by reflection and by echo." We are of opinion that the entire chaos has been due to too much reliance upon books—so that a plant having a large number of synonyms, some of which agree with a number of others, is a perpetual stumbling block to all learners and is the source of endless confusions.

Besides the physical obstacles presented by the size and extent of the field of investigations which have led to intellectual isolation and provincial exclusiveness, the interests of the science have considerably suffered from the fact that in modern times it has not been able to attract the devotion and energy of really able men. It is a commonly noticed fact that while the medical system introduced with the new civilisation has been receiving the sympathy and

support of the community, the indigenous system has been relegated in most cases to incapables who have no other career open to them.

There are no students in this field who can thoroughly sift and examine facts to find out the truth. There are very few original investigators for the purpose, none to make experiments and observations. Mere cramming is encouraged in this branch as in all other branches of study.

The teachers, again although sometimes very successful in the profession, are scarcely equipped with a thorough liberal education. Further, there are indeed very few institutions which systematically impart the necessary training. In the University again a student who takes science is debarred from studying Sanskrit and *vice-versa* ; but proficiency in Ayurveda on the modern lines requires a knowledge of science as well as of Sanskrit, so that modern University training also helps a student, very little in the pursuit of this most important of professions, unless he takes a special care to equip himself with all the qualifications—which are suggested in the following :

तत्त्वाधिगत शास्त्रार्थो द्रष्टव्यो स्वयं कृते ।

लघुहस्तः शुचिः शूरः सज्जोपस्कार भेषजः ॥

प्रत्युत्पन्नमतिर्धीमान् व्यवसायी प्रियंवदः ।

सताधर्मपरो यस्य वेदोद्देष्टुक् प्रशस्यते ॥

भावप्रकाशः ।

DEFECT OF PRESENT SYSTEM.

In spite of the great advantages of communication, there is very little work done for the identification of the plants. While the foreign systems have got these things identified most accurately by some of the greatest men of science of the present age, who have done their work with all the knowledge and force that science can lend to-day, it is a matter of very great regret that nothing practical worth the name has been done for the benefit of the Kabirajas in whose hands millions of men even now would trust their lives. These Kabirajas, however, some of them serving so angel-like for the cause of humanity, have got no proper weapons so fight with, no reliable medicine to give ; nor has any body ever identified the plants which play such a prominent part in their system in a way so popular as to be of any use to them. We should remember that while the foreign medicines are prepared by competent authorities, we depend for our drugs on the time-worn bags of Pansaries in the bazar. It is well known that the Pansaries have got most curious knowledge about such plants, although their stores form the sole store-house for the Kaviraj.

The Kaviraja who has perhaps finished his professional education in Benares or Calcutta cannot for various reasons follow the stringent rules of Charak and Susrut in being so acquainted with the nature of the Drugs inspite of the ever-improving railway commu-

nication ; his want of knowledge in English and Botany prevents him from taking advantage of the numerous plants properly identified, that are to be found in the very big Botanical gardens in Calcutta and elsewhere. Thus the invaluable work of the Government in this direction is of no use to this class of men.

They therefore use a good number of plants of which it appears the identification is wrong. This kind of mistake is principally due to the wrong interpretation in Sanskrit by persons who had no proper chance to see such plants in their range of experience.

The natural consequence of these evils which are cumulative in their nature, to the society at large has been a gradual depreciation of the practitioners in the indigenous System ; but the real misfortune is that we are apt to confound the practice with the Science and to condemn the System itself, the real merits of which seem to have been eclipsed in the hands of incompetent professional men.

SECTION 4.

THE WORK BEFORE US.

We have, therefore, a duty before us. We have to do what people in other countries have done in transforming their acquired and inherited treasure of knowledge and contributing to the stock of modern culture. We

have to place the Ayurvedic System before the world and vindicate its claim to recognition as a scientific method. The task is to present it in the systematic manner of modern science by working upon the materials left by our ancestors with the help of the scientific machinery to-day and modifying them, if necessary, with contributions from our personal investigations.

Nobody would be doing our own work. It is high time, therefore, that some men must undertake the task of setting right the chaos in our system and bring it to perfection along our own lines and in agreement with the modern scientific principles.

CHAPTER IV.

Examination of a few Indian Medicinal Plants.

We have discussed in the last chapter some of the causes of error that have of late vitiated the Ayurvedic system, and have justified the discredit and condemnation in which it is held by men educated in modern science. In this chapter * we intend to examine some of the mistakes that have crept in owing to the lack of Botanical and Pharmaceutical knowledge.

* The subject matter of this chapter is taken from our unpublished work on *Indian Medicinal plants*, in which an attempt has been made to discuss thoroughly the identification of plants and their industrial and medical uses along modern scientific lines and according to evidences of Sanskrit Literature.

There are three kinds of *difficulties in the study of plants* which we must guard against.

1. In discovering plants totally forgotten for a long time of which substitutes are authorised. In connection, with them however, the word अनुकल्प *i.e.* "possessing lesser virtues" is used, and this by no great and recognized authority of any ancient time.

2. In discovering plants for which no substitutes are mentioned. Here I may remark that these plants are not of such vital importance as those under 1.

3. In plants in which the substitutes are entirely wrong owing to very imperfect and worthless identification in most parts of India. In this case one has to face the greatest difficulty in over-throwing the opinions of long standing.

Our identification is based on the evidence of (1) History (2) Geography (3) Phology (4) General Botany (5) Industrial Medical and other uses of Plants.

After a careful study of all the available books on the subject I venture to say that I have identified a number of plants which seem to have been forgotten for a long time. These plants are of the greatest interest to all concerned with the Ayurvedic system of medicine being the first in the collection of पञ्चाग्न्यहोरात्रिकाः as described in Charak.

We find the following in *Bhabaprakash*.

जीवक, ऋषभक ।

जीवकर्षभकौ ज्ञेयौ हिमाद्रि शिखारोहवौ ।

रसोन कन्दवत्कन्दौ निःसारौ सूक्ष्मपत्रकौ ॥

जीवकः कूर्चकाकारः ऋषभौ वृषशृङ्गवत् ।

जीवको मधुरः शृङ्गो ऋषाङ्गः कूर्चशोर्षकः ॥

ऋषभो वृषभो धीरो विषाणो द्राक्षइत्यपि ।

जीवकर्षभकौ वल्ली शीतौ शुक्रकफप्रदौ ॥

मधुरौ पित्तदाहस्र-कार्श्यवातक्षयापहौ ॥

जीवकर्षभकौ भेदे काकील्यौ ऋषिद्विद्विके ।

अष्टवर्गोऽष्टभि द्रव्यैः कथितश्चरकादिभिः ॥

राक्षामप्यष्टवर्गं सु यतोऽयम् अति दुर्लभः ।

तस्मादस्य प्रतिनिधिं गृह्णीयात् तदुणं भिषक् ॥

भावप्रकाशः ।

Both of these plants have been described very creditably in *Bhabaprakash*. The author of *Raj Nighantu* writes about *Jivaca* being available in Gour, and *Rishavaca* in Gour and also in Kashmir. Hence Bhaba Misra living comparatively near to Gour may be taken to have a pretty good knowledge about these plants. Although the definite Botanical description is deferred till its identification is confirmed by the authorities at

Kew, I venture to say the following in its favour, suggesting the names of *Allium Jivaca* and *Allium Rishavaca* to *Jivaca* and *Rishavaca* respectively as most appropriate. In this we follow Sir William Jones, President Founder of the Asiatic Society of Bengal—"I am very solicitous to give Indian plants their true Indian appellations; because I am fully persuaded that Linnæus himself would have adopted them had he known the learned and ancient language of this country." (Vol. II Botanical Observations on Select Indian Plants by Sir. W. Jones).

Both fall under the class *allium*, both are bulbous, herbaceous plants belonging to the natural order *Liliaceæ*, having the bulb tunicated, spathe many flowered, umbels crowded, flowers regular, having segments slightly united below.

They have the following differentia. The bulbs are not enclosed in a common membranous covering. Leaves, long flat but slightly acute sheathing a few inches of the stem. Scape smooth and shining, rather weak, terminated by a membranous spathe enclosing a mass of flowers. The flowers are small and white.

Both differ from garlic or onion in not containing any appreciable quantity of Allylic sulphide, and there is consequently no unpleasant smell of those well known vegetables. The bulbs of both are full of a sweetish mucilage with very slight bitter taste and are much smaller than the common vegetable of the same class

available in the bazar. So far as I have been able to ascertain, I understand that the plants are to be found at 4,500 feet to 10,000 feet high above the sea level in the Himalayas, and both grow in forests or slightly open soils.

The difference between the two plants is as follows. The bulbs of *A Jivaca* are greater than those of *A Rishavaca*. The stem of *A Rishavaca* when it leaves the ground is of slight purple colour, to a few inches above the ground in the stem, which is not found in *A Jivaca*. The roots of *A Rishavaca* consist chiefly of two main roots below the bulb but in the case of *A Jivaca*, the roots are many but of smaller size. One very peculiar characteristic besides the above is that in *A Jivaca* some equally small roots appear a few inches above the bulb, the section at that place being just like a circular brush.

The characteristic difference of the roots did not fail to strike the ancient people as is shown in *Bhabaprakash*. Hence we find in the original Sanskrit that both of these resemble garlic in appearance रसोनकन्दवत् कन्दौ, both have slender leaves सूक्ष्मपत्रकौ, both are porous in the pith like straw hence निःसारौ, both are found in the Himalayas hence हिमाद्रिशिखरोद्भवौ. But *A Jivaca* is in the form of a broom कूर्चकाकारः, *A Rishavaca* वृषशृङ्गवत् resembles the horns of an ox.

In both the cases only the bulbs are used and so the attention of the Botanists was directed towards

these and their immediate neighbourhood. This explains why they have been guided by the peculiar roots in differentiating them.

Though the people of Nepal extensively use them as food and medicines they do not know that there are two varieties with different botanical characteristics.

I took their Photographs in the rainy season sometimes in August and planted them in my garden to mark the life history. When the stems were rotten, and new leaves appeared, the difference between the two plants altogether vanished, only the difference in roots remained. These new leaves were much broader than those in the photographs, about an inch broad, hence at this time the term सूक्ष्मपत्रक्री would not apply to either.

But the leaves do become slender when the plants are fully developed e.g. in October. And as the bulbs had to be collected sometime in October because of their cooling properties, the existence of slender leaves was likely to have been a most noticed fact. Thus we read—

शरद्वर्षिण कार्थ्यार्थं ग्राह्यं सरसमौषधम् ।

विरिक रसकार्थं तु वसन्तान्ते समाहरित् ॥

भावप्रकाशः ।

It is expressly written in *Bhabaparakasha* that since the plants of the "astabarga" are not available

ਯਾਦਿ. ਭੁਭਿ ।



even to the Rajas, others should be substituted in their places, indicating thereby that even in his times these were scarcely available.

Now जोवको मधुरः शृङ्गो ऋस्वाङ्गः कूर्चशोषकः is a point for consideration.

I have described A *Jivaca* as a little bigger than A *Rishavaca*. In the text, while A *Jivaca* is described as कूर्चकाकारः, and A *Rishavaca* is differentiated as वृषशृङ्गवत् like the horns of an ox.

But subsequently A *Jivaca* is described as smaller and शृङ्गः i.e., with horns ;

The text is evidently wrong and ought to read शृङ्गऋस्वाङ्गः i.e., ऋस्वाङ्गः or short statured because of the want of horns, as if the horns would give it a fully developed form.

In this we are supported by Amarkosha कूर्चशोषी-मधुरकः शृङ्गऋस्वाङ्गजीवकः in which शृङ्ग and ऋस्वाङ्ग are compounded.

The plants being so rare there was absolutely no means to correct this mistake which has been carried down to posterity.

ऋक्षिषि ।

ऋक्षिषिषि कन्दो द्वी भवतः कोशयामले ।

श्वेत रोमान्वितः कन्दो लताजातः सरन्ध्रकः ॥

स एव ऋद्धिबृद्धिश्च भेदमप्यतयोन्नुवे ।

तूलग्रन्थिसमाऋद्धि वामावर्त्त फला चसा ॥

बृद्धिस्तु दक्षिणवर्त्त फला प्रोक्ता महर्षिभिः ।

राजनिवण्डः ।

These as shown in the figure, are herbs from 10 to 12 inches high, hairy all through and having leaves long and woolly beneath, very closely allied to *Helianthemum Microphyllum*. They occur at a height of about 3000 to 5000 feet high on the Himalayas.

The peculiar turning of the flowers in the right and left directions is the only point which differentiates the one from the other.

Although we read that they grow in कोश्यामले we should not be surprised to get them in the Himalayas—which are vast enough to include all the “horizontal Zones” and “vertical regions” of the range of vegetation. Hence plants of very different climates can be seen here in some part or others. So we find in Charak :

श्लोषधीनाम् पराभूमौ हिमवान् शैलसत्तमः

“Himalaya is the best place for all drugs”

In both these plants we find rhizomes, leaves, and stems all covered with a cotton-like fibre which becomes very thick with the approach of winter, hence we find श्वेतरोमान्वितः कन्दः ।

Again when the old roots near the stem die out they leave a peculiar type of scar marks which are consequently indicated by सरन्ध्रकः । Being very small and of the type shown, these are termed लताजातः ।

Though the turning of the flowers constitutes the difference between the two, in the text we read of the fruits as being turned. This, however, makes no difference in the matter of identification.

In तुल्यन्यसमा we are not definitely told whether the rhizome, flower or fruit is of this nature. We may think that they meant the flower by the above, as practice in Nepal also supports this view.

Both flower in the rainy season. The Nepalese use them in igniting fire as a ball of cotton which they derive from them. They use it in medicine as they use *Jivaca*,

Both belong to the natural order *Compositæ* and perhaps the most appropriate names would be *Helianthemum Riddhi* and *Helianthemum Briddhi*.

मेदामहामेदा ।

महामेदा भिधः कन्दो मोराङ्गदौ प्रजायते ।

महामेदा वनौमेदा स्यादितुक्तं मुनिश्वरैः ॥

शुक्लार्द्रकनिभः कन्दोलताजातः सुपाण्डुरः ।

महामेदाभिधो ज्ञेयोमेदालक्षणमुच्यते ॥

शुक्लकन्दो नखच्छेदो मेदोधातुमिव स्रवेत् ।

यः स मेदेति विज्ञेयो जिज्ञासातत् परैर्जनैः ॥

स्वल्पपर्णी मणिच्छिद्रा मेदा मेदीभवाध्वरा ।

महामेदा वसुच्छिद्रा त्रिदन्ती देवतामणिः ॥

मेदायुगं गुरुस्तादु वृष्टं स्तन्यकफावहम् ।

वृंहणं शीतलं पित्तरक्तवातज्वरप्रणुत् ॥ भावप्रकाशः ।

Both the plants are seen मोराङ्गादौ *i.e.* in and about Morang ; that is, both are of the Himalayan origin—Morang being the name of a place near Nepal and in the same territory in the Himalayas. Both again are nearly alike excepting that महामेदा is सुपाण्डुरः *i.e.* Mahameda is yellowish-white but Meda has a white rhizome. Although *Pandura* may also means 'white' it is here to be taken as different from white, particularly because this is the only differentiating characteristic between the two.

Both of these are of the same species and hence it is sufficient to describe either.

Their rhizomes are just like white *zingibar officinalis* *i.e.* शुक्लार्द्रकणिभः कन्दः । Hence also लताजातः In these rhizomes we find remarkable scar-like marks or cicatrices of old branches which have been given the appellation of मणिच्छिद्रा and वसुच्छिद्रा Here it is further indicated that Meda has five and Mahameda has eight cicatrices or so many joined rhizomes, so the latter is a trifle bigger than the former.

The different sections, being nearly triangular in shape, have been properly described as **त्रिदन्तो** or having three teeth or angles, referring to the canine teeth of man or lower animals. The leaves are few and far between and alternate throughout the stem ; or more accurately, it has got stems with alternate leaves arranged in a quinquennial manner, the sixth leaf is directly above the first whence commences the second cycle, hence, **स्वल्पपर्णी** ।

Again, when the Rhizomes are scratched with the finger, we get a slippery fatty envelope just underneath the outer skin, hence it is described as **नखच्छेद्यो मेदो** **धातु मिवस्त्रवेत्** particularly showing that it is very soft in the raw condition, and the rhizomes abound in this gummy juice in this condition. They are largely eaten by the robust hillmen and are used in medicine just like *Jivaca* and others of the same group.

In Nepal, however, a curious confusion has been made between these and **काकोली** and **चोरकाकोली**. These two, as already stated, are described as **शुक्लार्द्रकनिमः कन्दः**; but in **कीकोली**, **चोरकोकोली** we find later on **पीपरीसदृशी कन्दः** i.e., the former to have rhizomes like ginger and the latter have roots like those of *Asparagus*. But all these, being in the *Astargha* **षष्टवर्ग**, have got many common properties. Hence, the Nepalese are not very far from getting the desired result. Since they get tolerably good results

they made no further inquiry because no curiosity is roused as to the effect of these, thus the mistake has been continued for generations.

The men in Nepal also divide the plant into different classes according to the various shades of colour ; sometimes into two, and sometimes into four.

In all the types the buds seem to lie dormant during the entire winter season and only at the approach of spring the stems shoot forth with full vigour.

काकोली क्षीरकाकोली ।

जायते क्षीरकाकोली महामेदोद्भवस्थले ।

यत्र स्यात् क्षीरकाकोली काकोली तत्र जायते ॥

पीवरीसदृशः कन्दः सक्षीरः प्रियगन्धवान् ।

सा प्रोक्ता क्षीरकाकोली काकोली लिङ्गमुच्यते ॥

यथा स्यात् क्षीरकाकोली काकोल्यपि तथा भवेत् ।

एषा किञ्चिद्भवेत् कृष्णा भेदोऽयमुभयोरपि ॥

काकोली वायसीली च धीरा कायस्थिका तथा ।

सा शुक्ला क्षीरकाकोली वयःस्था क्षीर वल्लिका ॥

कथिता क्षीरिणी धीरा क्षीरशुक्ला पयस्विनी ॥

काकोलो युगलं शीतं शुक्लं मधुरं गुरु ।

वृहणं वातदाहास्रपित्तशोष ज्वरापहम् ॥

भावप्रकाशः ।

It is clearly shown that these two are also found in **मोरङ्ग** Morang *i.e.* in the Himalayas as aforesaid. The roots of both are like those of **पोवरौ** or *Asparagus Adsendens*.

Both are nearly the same in appearance **किञ्चिद्वेक्कणा** *i.e.* have a blackish tint over the green colour of the leaves and stems.

In Nepal one party holds **मेदा महामेदा** as **काकोली** and **चौरकाकोली**. This is, however, evidently wrong as shown before. The next opinion of importance is about two other plants called **कन्सेलहरो** and **कालाकन्सेलहरो** in Nepali. These satisfy all the descriptions given above. The plants are found on the banks of the river Kousiki. The plant yields a milky juice when broken. The vernacular names show that one is of a blackish hue and this is the *Kakoli*, and the white variety is *Kshurakakeli*.

Besides the above, there are to be found in and near Nepal two kinds of plants which are called **यष्टीमधु**. These two plants have also got their roots thick and fleshy just like *Asparagus*. These are sweet to the taste and locally employed for **यष्टीमधु** (*Glycyrrhiza Glabra*) although this latter is undoubtedly too well known to be so confounded.

But all of them, being of the *Jivania Gana* of Charak, have got many properties common; hence, as in **Meda** and **Mahameda**, the distinctions are not so

marked. It goes without saying that the things that have found currency in the market under the above names in the plains of India are all spurious and worthless imitations and are the result of utter ignorance about the genuine plants.

ACONITE GROUP AND OTHER POISON

“The germs of perennial herbs belonging to the natural order *Ranunculaceæ* and the tribe *Hilleboreæ* comprising about 180 species, inhabitant chiefly of the Northern temperate Zones, some seven species being met with on the Himalayas. The members of these germs are exclusively confined, as far as India is concerned, to the Alpine and sub-Alpine regions chiefly occurring on the Himalaya from Nepal westward to Kashmere. Of the seven species there are two or three varieties under two or three of these species. One contains no poison, *Aconite heterophyllum* अतिविषा is largely eaten as vegetable or mild tonic. Of the other species some are poisonous others not; and even some of the varieties of one species are poisonous, while others not. The poisonous species have never been identified accurately and the result is that, of a given weight of the root sold a certain percentage frequently contains no aconite whatever, indeed an entire consignment may be perfectly inert. This uncertainty renders the use of aconite objectionable, its action not being constant; but it is for certain forms of malarial fevers and all skin diseases the most valuable drug known. It is much to be regretted that

so valuable a medicine should thus suffer in consequence of ignorance." (A 398. *Economic Products of India* by G. Watt).

Thus we see that although there are 180 speices of *Aconite* in the world there are practically only four very important poisonous species available in India. Hence the accurate knowledge of our sages in matters of the vegetable kingdom is well illustrated when Susrut declares चत्वारिवत्सनाभानि सुस्तकेष्वेप्रकीर्त्तिते ।

We also find the four principal poisonous forms of aconite as (1). *Aconitum Lycoctonum*, Linn.

(2). *Aconitum palaetum*, Wall.

(3). *Aconitum Ferox*, Linn.

(4). *Aconitum Napellus*, Linn.

The non-poisonous aconite species seem to have been included under the different forms of अतिविषा । So we find. —

श्यामकन्दा चोपविषा सा विज्ञेया चतुर्विधा ।

मदनपालः ।

सुस्तक and the remaining two kind of aconite resemble very much *Cypripedium scariosus*, and consequently have been so named. मूलकविष is called मूलक in Nepal and is a reputed poison. हालाहल is also recognised to be a deadly poison in the Himalayas where the hill men gave me a striking idea about the origin of the name.—They say हालाहल because an animal taking

the poison dies instantaneously. कर्कटक is also called there कुटकुटेविष and is recognised as a poison, हारिद्रक is known as पहेलो (yellow) विष and this is also a deadly poison.

These however having very active principles require very thorough investigation. Further points concerning them have been fully discussed in the *Indian Medicinal plants*.

गजपिप्पली (*Piper Chaba, Hunter.*)

करिपिप्पली ।

कपिवल्ली कोलवल्ली अयसो वशिरः (पुमान्)

चयं तु चविका ।

अमरकोश ।

गजोषणा चव्यफला चव्यजा गजपिप्पली । रा ।

चयं चरणमुच्छिष्टं चविका कोलवल्लिका ।

तत्फलं अयसो हस्ति मागधागजपिप्पली ॥

गजकृष्णाकटुर्वात श्लेष्मनुदह्नि वधिनी । म ।

चयं कोलाच चविका अवनं कोलबल्लिका ।

तस्याः फलं गजाङ्घ्रास्या गजकृष्णाच अयसो ॥

इभकृष्णाकरिकाणा वशिरो गजपिप्पली । कै ।

चविकायाः फलं प्राज्ञैः कथिता गजपिप्पली । भा ।

As regards Amarkosh two of its most important commentators write as follows—

(1). H. F. Colebrooke writing as far back as 1825 writes this as a sort of pepper “another sort” and after this he remarks in “चव्य” as the plant.

(2). पंडित् देवदत्त तिवारी writes छोटीपीपरी वा गज-
पीपरी so चाव वा पीपरी को लकड़ी in his commentary
in 1879.

We also find in Dr. George Watts' *Dictionary of the Economic Products of India* under "Piper Chaba, Hunter "A native of Moluccus* cultivated in India for the sake of its fruits. The fruit is considered stimulant etc, P. 1257)"

"Its fruit is the long pepper of European commerce and is imported into Calcutta *via* Singapore. The fruit is considered aromatic, stimulant and carminative, occasionally used in medicines for coughs and throat affections. It is obtainable in the bazars, but is not much used in Native medicine." (P.241 *Indigenous Drugs of India*—Dr. K. L. Dey). Similarly most men would acknowledge the medicinal virtues of this pepper. But very unfortunately all writers describe this as *Scindapsus officinalis* or *Pothos officinalis*, Roxb.

The word गजकृष्ण very aptly refers to the remarkable dirty black colour of this fruit. The colour of the current medicine is rather much too whitish for this description ; and if it can have any resemblance to the colour of elephant at all it must be that of the much valued white elephant of Burma which is, after all, a sickly elephant of no real worth.

* For which Dhanvantari remarks of its origin as in some Island द्विपपिप्पली

It may be further noted that this plant and its fruit are very much liked by monkeys, hence we find कपिवक्त्रि ।

Although the mistake is so palpable it is a matter of surprise that it is almost universally committed in practice throughout the plains of India.

To support the Sanskrit authorities quoted above I may remark that the proper usage of the fruit has been kept in tact in Nepal, where so many of such Ayurvedic medicines are rightly used even now by the public ; this is called चमोका फल in the Nepali language.

Mere philological reasons are not sufficient to outweigh standard ancient authorities specially when we see that the word गजपिपल is used for the following besides the above in different parts of India ;

- (1). *Piper longum*.
- (2). *Plantago amplexicaulis* Cav. Isafgool.
- (3). *Plantago Major*, Lime
- (4). *Piper chaba*. (5). *Pothos officinalis*.

Surely these have been in use for ages in different parts of the country. It is interesting to note that from the time of भावप्रकाशः the drugs have been getting more and more out of the memory of man—a time which agrees very well with the introduction of the European system of medicine into India. The political disturbance put a bar to safe and easy communi



प्रियङ्गु ।

cation, and an unavoidable stoppage in the use of proper drugs along with many other important thing was only just natural. This is particularly evidenced by the fact that this author has so often thrown the burden of proof, upon others by such expressions as प्राज्ञैः कथिता । कथिता मुनिपुङ्गवैः ।

We can therefore identify this plant neither by, usage, nor by reference to authorities subsequent to *Bhabaprakash* but solely by consulting botanical writings previous to it.

प्रियङ्गु ।

प्रियङ्गु फलिनी कान्ता प्रियाङ्गा वनिता लता ।

श्यामा गोवन्दिनी वृत्ता कङ्कणी प्रियवल्लीका ॥

गन्धप्रियङ्गुर्महिला करम्भा वर्ण भेदनी ।

विष्वक्सेना कोलभङ्गी भङ्गुरा पर्णभेदनी ॥ कैः ।

फलप्रिया गारो कङ्कुरा गोरवल्ली सुभगा शुभापीता मङ्गल्या श्रेयसी ।

राजनिवण्टुः ।

In this tree also there seems to be very great confusion indeed. I shall first describe the current form and then describe what ought to be. This is the *Algaia Roxburghiana*, W. A. This is "a large tree of the Western Paninsula from the Konkan and Midnapur southwards to Ceylon ascending to 6000 feet. Leaflets 5, rarely 7, elliptic obtuse, glabrescent, panicles dense flowered somewhat supra-axillary pyramidal elongate

flowers on very short pedicles 2 inch in diameter, Calyx yellow, often covered with styllate hairs. Fruit $\frac{1}{4}$ in. diameter buff coloured minutely pilose, fruit said to be edible." (Dr. G. Watt.)

In common language we may just describe its seeds to be just like those of Nimm although a little bit smaller.

Now the first and most important name प्रियङ्गु, कङ्गु, कङ्गुणी would be quite sufficient to rebut the above by the very resemblance of the seeds to the well-known Panicum Miliacium or कङ्गु । लता वनिता कान्ता महिला प्रिया would undoubtedly show that it is a creeper or a slender shrub most possibly taken from the fact that since the wife depends upon the husband for her maintenance or otherwise this slender plant being very soft and weak and specially charged with thick clusters of fruits (hence फलिनी), generally bends down unless supported by a stronger tree in its neighbourhood. Its tender nature is further described by the word भङ्गुरा । वृन्ता, कङ्गुणी, कङ्गु, would further show that the seeds are spherical and to these the terms शुभापीता, गौरवहो, गौरो are applied ; and perhaps the poet's imagination was drawn to the fact that a wife becomes dearer and more charming if she produces a few lovely sons, so this plant producing such small charming yellow seeds in clusters and in such abundance has got all the terminology of such a

successful wife प्रियवल्लिका, प्रिया, मङ्गल्या, श्रेयसी, सुभगा, श्यामा । The very colour of the leaves and stems also, however, is yellowish green and this must have also struck the authors in describing the plants. The primary umbels carrying the clusters of flower and seeds shoot up from the axil, and hence the term पर्णभेदनी । The flowers are quite small and are of a violet colour and they indeed look very charming when they are full blown hence प्रियङ्गु, कलिका श्यामं रूपेणा प्रतिमं बुधं । नवग्रह स्तोत्रं ।

Now the entire description so far given of this important plant agrees absolutely with the plant that is actually used in Nepal प्रियङ्गु, गन्धप्रियङ्गु, which are called दयालो खेतोदयालो in the Nepali language. I have the picture of one, as the other is exactly alike it excepting smell. The leaves of both are whitish green but they are whiter in the case of खेतोदयालो । The leaves are larger than those of ordinary trees and are rough to the touch.

In Chittagong and some parts of East Bengal this is known to be प्रियङ्गु । In Benares I met a Brahmin Pansari who had the real प्रियङ्गु, and he knew it to be such, but it is to be regretted that he could not find a purchaser for the genuine article while the imitation sold indeed for a very high price. Thus we find in many cases गोरस गलि गलि टूटत [पूछत बात न कोई] सुरा

वैठल विकाय । But here it applies more than elsewhere and this is surely to be highly deplored.

कर्ण स्फोटा ।

कर्णस्फोटा श्रुतिस्फोटा विपुटा कृष्णतण्डुला ।

चित्रपर्णी स्फोटलता चन्द्रिका चार्द्र चन्द्रिका ॥

कर्णस्फोटा कटुस्तिक्ता हिमा सर्वविषापहा ।

ग्रहभूतादि दोषघ्नी सर्व व्याधि विनाशिनी ॥

राजनिघण्टुः ।

This is the plant that goes by the name of *Cardias permum Holicacabum* or लताफट्की, नया फट्की नोयाफट्की, कानफुटीवोड़ा Bomb. A climbing herbacious plant plentiful in the plains of India chiefly in Bengal and the United Provinces distributed to Ceylon and Malacca. Tendrils are modifications of the portions of the flower bud. Fruit triquetrous inflated. The seed is officinal in the Punjab. It is used as a tonic in fever. Here, however, I find that although the name मालकाउनी has been given to ज्योतिष्मती as the Hindi equivalent लताफट्की has been given the Bengali equivalent. This is no doubt an efficacious thing but instead of giving it under the heading of ज्योतिष्मती the philological reasons, would I believe, take it under कर्णस्फोटा । We see above that it is named कानफुटी in Bombay. Also from लता we get नया again consider the term नयाफट्की, once

reverse the order of the parts स्फोटलता and both these terms are directly derived from स्फोटलता । Again it is named कनकाइया which has also been apparently derived from कणस्फोटा being derived from कान । The value is not lowered in making the substitution, as here also we find the high eulogy सर्वविषापहा । So far as I have seen, all modern authors are silent about it but my argument is supported by such an eminent authority as the author of राजनिघण्टुः who writes the native name of his time to be कानफोडा । *Celastrus Paniculatus* is मालकाञ्चोनी and this can never be the synonym of *Cardiospermum Halicacabum*.

भार्गी ।

खरशाकं शुक्रमाता भार्गी ब्राह्मणयष्टिका ।

फञ्जी पद्माङ्गारवल्ली महागर्दभ गन्धिका ॥

भृगुजा भृङ्गजा हञ्जी पालिन्दी भार्गपर्विणी । कै ।

भार्गी भृगुभवा पद्मा कासघ्नी गन्ध पर्विणी । म ।

खरशाकं शुक्रमाता भञ्जी ब्राह्मण यष्टिका ॥ म ।

About this very important plant I first beg to state what are used, as such, and then I shall give my own description :

1. *Clerodendron Sephonanthus* R. Br. called भारङ्गी H वामुनहाटी Beng. माराङ्गी Bomb.

" A large shrub, with red calyx, white flowers, and blue berries found in Kumaon, Bengal and South India,

it is also common in gardens in Ceylon where it is not indigenous. It yields a gum." (1394 C'Dictionary of the Economic Products of India)

2. *Picrasma quarsioides* भारङ्गी, चारङ्गी । A small tree belonging to Sub-Tropical Himalaya. According to the Pharmacopœia of India the wood is brought to Bengal from the hill under the name of Bharangi, but the authors of the *Pharmacographia Indica* have shown that what is usually sold under this name is the roots and stems of *Clerodendron Serratum*, (P 236 I. D. K. L. Dey)

3. *Clerodendron Serratum*, spreng भारङ्गी, Guz. भारङ्गी भारतामूल ब्रह्मारि, गन्दु भारङ्गि भारङ्गी चुया । A blue flowered shrub, common in the Sub-Himalayan tracts, from the Sutlej eastwards to the Khashia hills, South India and Burma (1388 c.). Dr. Dymock affirms that this species is used for the same purposes and is known by the same name as *Clerodendron Siphonanthus* R. Br.

4. In the habitats and other descriptions that would not agree with the Nepali चिण्डे of course the last one is somewhat like it. This is a very tall tree growing upon stony hills in and near Nepal and specially in precipices hence भृगुज भृगुन्वा as we see in *Amarkosha* प्रपाततु तटो भृगु; very peculiarly its leaves have got the veritable smell of the ass and much more than the beast has got. A few leaves well smeared with hand will emit the characteristic smell to a distance of about 20 feet ; hence खरशाकं महा गर्हभगम्बिका ।

Its leaves are eaten both by men and animals. It is said to increase the milk in a cow etc. It has degetate leaves. The leaves are smooth and yellowish green and the petiole shoots off a long way from the axil before the leaves are seen, the axillary angle is also sharp hence भार्गपर्विणी । The branches when broken turn black in the broken parts hence we find अङ्गारवल्ली । The petioles and branches when broken also give out the same smell so we get गन्धपर्वणी । Lastly this is also used in Nepal as such. Hence considering all the circumstances I am of opinion, that although the other things may be good in themselves this last named plant ought to be identified as भार्गी of our Sanskrit authorities.

पाषाणभेद ।

अश्मभेदो दृषभेदः प्रस्तरो नगभेदनः ।

पाषाणभेदो नगभि दश्महाश्मरि भेदनः ॥ कै ।

शिलाभेदः शैलगर्भजा । म ।

गिरिभित् । भावप्रकाशः ।

In this plant also considerable confusion exists as to its identity and since it is to be found in the hills generally we expect the mistakes, and these are only natural for the men living in the plains. After I have described what is used in Bengal and other places I shall describe what ought to be the proper plant..

Coleus aromaticus, Benth. पाथरचुर H. and B. and Bomb. पाथरचुर Mar. A native of the Moluccas cultivated in gardens throughout India, has a pleasant aromatic odour and pungent taste. The plant is employed in Cochin China, according to Loureiro (Flor Cochin page 452) in asthma, chronic coughs, epilepsy and other convulsive affections. Dr. Wight speaks of it as a powerful aromatic Carminativa. In Bengal, it is used in colic and dyspepsia.

The tree पाषाणभेद however, is *sexafraga Lingua lata*, Wall : This is also called पाषाणभेद in Hindi and Punjab, शिलफोड़ा in Kumaon पाषाणभेद in Nepali. A small plant with leaves frequently a foot in diameter which occurs in the Temperate Himalayas from Bhotan to Kashmir at altitudes between 7900 and 10000 feet. It is met with also in the Khashia Mountains at an altitude of 4000 feet. The root is used as a tonic in fevers, diarrhoea, and cough and as an antiscorbutic. It is bruised and applied to boils and in ophthalmia. It is also considered as absorbent and is given in dysentery (Susrut). For the philological and geographical reasons and more particularly the latter ones that ought to go by the name of पाषाणभेद । It might be remarked that all the terms given for its names are practically the same, even a few others as अश्वरोधेदनः । अश्वहाः are no doubt derived from पाषाणभेदः । नगभिद्, by persons who were so well ac-

quainted with the doctrine of signature. Consequently all available description would very reasonably confine the plant to शिलफोडा of Almora or पाषाणभेद of Nepal, and nobody would doubt this when he sees it actually coming out from the veins of rock.

As regards usage also in all the countries where it grows it is used in practice as पाषाणभेद ।

There are in the genus of *Saxafragaceous plants* 160 known species 35 of which are to be found in India, these inhabit the cool temperate and specially Alpine localities.

These are classified in our system broadly in four ways पाषाणभेद । क्षुद्रपाषाणभेद । वटपत्री । श्वेतशिलावल्का । In Nepal these four are differentiated again as follows—

पाषाणभेद । रातोफुल फुल्ने ढुलो पाषाणभेद ।

क्षुद्रपाषाणभेद । रातोफुल फुल्ने सानु पाषाणभेद ।

श्वेतशिलावल्का । श्वेतफुल फुल्ने ढुली पाषाणभेद ।

वटपत्री । श्वेतफुल फुल्ने सानु पाषाणभेद ।

Besides, पाषाणभेद contains large circular hairy leaves, hairy at the lower paginæ and circumscription as well as in the petiole. The lower paginæ is coloured red and the upper green. The upper surface is glossy and looks like the leaves of Nymphus Lotus. It has red flowers.

बुद्रपाषाणभेद is similar to पाषाणभेद but its leaves are smaller and both the lower and the upper paginæ are green.

वटपत्री is like पाषाणभेद but its leaves resemble those of *Ficus Bengalensis* although much larger. Further it has white flowers खेतगिलावल्का this is like the last but its leaves are more circular and the flowers white.

तगरः ।

तगरः कुटिलंजिह्वं नतं कालानुसार्यकम् ।

वर्हिष्ठं वर्हिण्वक्त्रं शठञ्चनघुषं नृपम् ।

अपरं दण्ड मातङ्गं कुञ्चितञ्च महीरगम् ॥

कटुकं पिण्डतगरं दीनं कालानुसारिका ॥ कैः ।

दद्रुहस्तं । राजनिघण्टुः ।

In this we have a peculiar kind of confusion. In the plains generally *Valeriana Hardwickii*, Wall is taken to be तगर this is called तगर in Hindi Beng., P.B. Bomb. but also वाला in the Punjab but चर in Central Provinces.

It is a perennial herb of the temperate Himalaya from Kashmir to Bhotan at altitudes of 4000 to 12000 feet. Also met with in the Khashia mountains between 4000 to 6000 feet. The root is exported to the plains partly for medicinal use but mainly as a perfume.

A second type called *Valeriana Officinalis*, Linn is found in North Kashmir at Sona Murg altitude 8000 to 9000 feet.

A third variety *Valeriana Wallichii* D. C. called वाला, चर, चरगोजर in the Punjab, root तगर । Grows in temperate Himalaya from Kashmir to Bhotan at an altitude of 10000 feet the root is used in every way similar to that of *Valeriana Hardwickii*.

Now the author of राजनिघण्टु, writes तगर and पिण्ड-तगर in पुष्यवर्गे—and gives the names of his time तगर, नदीहृत् । तगर ॥ पिण्डतगरति कोकणे प्रसिद्ध; and describes them in his पुष्यवर्ग and not in the चन्दनादिवर्ग । It seems to be a remarkable thing that none has hinted these to have the exquisitely fragrant smell which is so common of the group of plants above mentioned. This itself is sufficient to throw great doubt in the whole affair. Again these have very minute white flowers in umbels crowded together. I grew it in Nepal in a considerable portion of land but I could rarely get any seed. Its minute flowers would at once conclusively prove that it cannot be, for any reason placed in the पुष्यवर्ग which the author of राजनिघण्टु, has really done. Again this authority both in Kashmir and Konkan could never have written that पिण्डतगरति कोकणे प्रसिद्ध; whereas he must have known perfectly well that it could be got in Kashmir and not in Konkan.

Further nobody can name **सम्यो** as **तगर** who has seen what it really is, and much less could the same recognised authority name it as such if Valeriana were really **पिण्डतगर**। Besides the words **नदीवृक्ष**, **दण्डमातङ्ग** etc. can scarcely be applicable to it. I am of opinion that none who has seen the life-history of this plant and the place where it grows and the characteristics it has, can from geographical, and Botanical name and descriptions identify the plant in any way as **तगर**। It appears to be nothing short of gross blunder and I do not know how it could happen at all. The remaining points in my controversy will be further cleared in my description what ought to be **चोरक** proper and the reasons for my so identifying will also be seen therein.

The true **तगर** is called *Taberemontana Coronaria* Br. and this is called **टगर** in Hindi, Beng., Bomb., Mar., Guz., **ग्रन्दि टगरम्** in Tel. A small evergreen shrub, with silvery bark and glossy leaves, cultivated in gardens throughout India. A red pulp is obtained from the aril or the extra coat of the seed which gives a red colour. The wood is used medicinally as a refrigerant and is used for incense and for purposes of perfumery. The sweet scented flowers are esteemed for decorative purposes.

The other variety is called **काटमल्लिका** in Bengali and **तगर** in Nepali. In Nepal the first variety is called

पिण्डतगर and this one **तगर** । The Nairs—the ancient inhabitants of Nepal are enjoined by their Sastras so much that in case they cannot get its flowers in their Sridh Ceremony they are to offer a few leaves of the **तगर** । The use of white flowers in Sridh is well-known to all Hindus and this being one of the best of its kind is the more in demand for it. Hence undoubtedly its name as **पिण्डतगर** । The curve pods containing the seeds are referred to by **कुटिलं, वक्रं, शठं**, peculiar peeling off of a portion of the white silvery bark or what appears like lichen is pointed out by the term **ददृहस्त्रं** meaning here the branch of the tree. **दण्डमातङ्ग दण्डहस्ति** most possibly refers to the size of the tree.

Besides the above, the time immemorial usage of these as **तगर** in Nepal would sufficiently guarantee its usage as such.

चौरक *Valeriana Handwickii* etc. grow near water or at least in very moist place and in the Himalaya these are highly sweet scented herbs. Had these been **तगर** these could never have been omitted in the description by an ordinary man what then to speak of such high class specialist like **कैयदेव** and Narahari Pandit.

Hence considering the above I hope that due credit should be given to each, the first described plants should be introduced as **चौरक** for reasons stated here-

under and the last one or two should be used as तगर पिण्डतगर respectively. In the current practice I have not seen any authority that marks out any distinction between these two plants.

Valeriana Hardwickii Wall and the others of its genus should be properly identified under चौरक ।

चौरक ।

We get the following from the Sanskrit texts

चोरको गोपनक्षेमो दुष्पुत्रो देष्कुलो रिपुः ।

फलचोरः चौरौ शङ्खिनिका शठौ । कै ।

ज्वरगन्धहन्त्रि । कं ।

चौरस्तु फलचोरकः । रा ।

चोरकस्तोत्रगन्धोष्णस्त्रिक्तो वातकफापहः । रा ।

दुष्कुलोऽग्रनिलश्चैव सुग्रन्थिः पर्णचोरकः

ग्रन्थिपर्णो ग्रन्थिदलो ग्रन्थिपत्रो । रा ।

चर which has been just derived from चोरो, चोर is used, as its local name indicates in the Punjab and Central Provinces. Further even its Hindi name बालछड़ also seems to have been ultimately derived from चर ।

The keynote has been given in the term **चौरसुफल** **चोरकः** as described by Narahari Pandit and it is clear that when once the term **चौरः** has been assumed all the other terms naturally follow the poetic extravagance in quick succession. As already pointed out its flowers are very small and the seeds if ever seen, are, exceedingly minute. The word **शडी** would also very clearly point out its resemblance to **शठी** or *Curcuma Zerumbet* in having a rhizome and that too, sweet scented.

This last fact is further supported by the text of **राजनिवण्ट**, which describes it as **तोत्रगन्ध** and owing to its fragrant smell it can surely correct the foul air of a place and hence in **कौयदेव** we find **ज्वरगन्ध** । Its knotty stem is well-known to all, hence **ग्रन्थि** । **सुग्रन्थि** ।

It is a striking fact that we find *Chrysopogon aciculatus*, Trien as **चोरकाँटा** in Bengali **शङ्खिनि** and **चोरपुष्पो** as Sanskrit and **लाम्पा** as the Hindi equivalents. In Dr. George Watt's Economic Products of India where it has been described as follows "A small coarse grass, growing on moist pasture ground throughout Bengal, also in the North-West Provinces, Central Provinces and in the warmer parts of Ceylon. Cattle do not seem to like it." The above falls so short of the description that I need not enter into any criticism about it.

नलिका ।

This also shares the fate of many others

नलिका विद्रुमलता कपोत चरणा नटी ।

धमन्यञ्चनकेशीच निर्मध्या सुषिरा नली ॥

नर्तकी, शून्या । के ।

रक्तदला । रा ।

I have not been able to find any reliable information about what is sold in the bazar as such. But I see no authority who has described what, for reasons stated, ought to be identified as नलिका ।

As a matter of fact it is the well-known *Onosma echoides*, Linn रतनजोड़ in Hindi महारंगी, in Nepal रतनजोड़, महारंगी, लालजड़ी, क्रीन in the Punjab. A hispid, binnial plant, frequent throughout the Western Himalaya from Kashmir to Kumaon. It is widely distributed from Cabul to France.

The root is used in the Punjab, Himalaya and Trans-Indus region as a red dye for wood (Stewart) being applied with ghee and the acid of apricots. It is utilized as a substitute for Alkanet and imparts a rich red colour to medicinal oils and fats e. g. Macassar oil (Stewart). In Nepal these roots brought from the Tibetan border are boiled with oil and used as a dye

for the hair. The bruised root is used as an application to various forms of cutaneous eruptions. The leaves are said to possess alterative properties and the flowers are prescribed as a stimulant and Cardiac Tonic in rheumatism and disease of the heart. कपोत चरणा is derived from the red colour of the root. रक्तदला of Raj-Nighantu is to be taken to mean the membrane just under the leaves and in connection with the root.

नलो निमग्धा and शून्या refer only to the great porosity of the roots. नटी and नर्तकी refer certainly to the red colouring principle with which the cloth or, oil and other things can be dyed beautifully red—these being so essential in the art of नर्तकी नटी these are used as synonym of the plant. As stated above, the fact that it should be used in the Macassar Oil and that in Nepal these roots should even be brought from difficult places to use them along with oil to promote the growth of hair, are facts that would undisputably prove the fitness for the term as अञ्जनकीशी There is the more reason for its being used in oil as we see कुष्ठ कञ्जण्डयेत् ।

Maharaja Jung Bahadur of Nepal, who so much encouraged the Ayurvedic System made a searching inquiry as regards नलिका through his Pandits, in the course of preparation of some valuable oil for whose मूर्च्छन it was necessary. His Pandits after a careful investigation of its local usage and medicinal effect

came to the conclusion that this is the true नलिका of the Sastras. Thus it was and is still so used in Nepal.

अमूवेत ।

वेतसामोऽलाबुसुच्छतवेधी सहस्रभिः ।

अमोऽमवेतसो भीमः शाखामोवोरवेतसः ॥

रक्तसुवश्च मांसारिः शुक्रकोऽग्रिमवेतसः ।

वेधको वोधको द्रावी रसामो वातिकप्रियः । कै ।

लमाङ्गुश फलाम । रा ।

अमवेतस भोटदेशे प्रसिद्धः । रा ।

द्विधा स्यादमूवेतसः । रा ।

द्विविधाह्यमूवेतवः (दाडिम्ब) । मदनपालः ।

There seems to be considerable difficulty in the indentification of this plant as well. Shiba Das the commentator of चक्रदत्तसंग्रह writes in explanation of अमूवेतस as “थैकलइति वङ्गभाषा प्रसिद्धः consequently this is used in Bengal as अमूवेतस along with the stem of *Rhuberb Emodi* which is also at times palmed off as अमूवेतस । थैकल is called and described as follows—*Garcinia pedunculata*, Rox—a tall tree of the forest of North Eastern Bengal near Rungpur and Goalpara and of Sylhet. It flowers from January to March and its fruit ripens from that time to June. The fruit is large, round, smooth, yellow and is edible. The fleshy part of the fruit which covers the seeds and

their proper juicy envelop or aril is in large quantity of a firm fixture and of a very sharp, pleasant, acid taste. It is used by the Natives in their curries and for acidulating water. It is cut into slices and dried it retains its qualities for years.

In Raj Nighantu and Madanpal we found however दाड़िमपाठे कषायानुरसं ग्राहि द्वियिधा अमलवेतवश् । Here we first meet with the difficulty. If we assume the above as अमलवेतम येकल we are at a loss to find out two different kinds of येकल When I was at Gwalior I first met there a famous tree called अमलवेत on the bank of the celebrated lake of Maharaja Nala whose fried fish is said to have escaped in it. This now goes by the name of टाकोनि Besides this there is another tree in Chandrapuri once the capital of Maharaja Sishupal but now in ruins and its present name is Chanderi. Both these trees are exactly of the same kind and name. The fruits of both are collected by both the Kabirajas and Hakims remaining far away from them and both employ them in such medicine as भास्कर लवण and others promoting digestion and these professional men also call the fruits as अमलवेत ।

In Nepal, however, I was surprised to see that the same fruit what I saw in Gwalior and another also of the same genus are indiscriminately used as अमलवेतम् । These are called चुकत्री and शंखत्री in Nepali language

The authoritative books in Nepal also give these out as अमृतवेतस । My surprise has been much more when in Almora—a town in the Kumaon division—our ancient कृष्णचल, I find the same view of Gwalior is further supported. In Bhabar—part of Terai—the plants grow in abundance and here the fruits go in the name of अमृतवेत । These are seemingly like *citrus medica* and the trees are also of the same genus but the fruits are intensely acid in taste. The fruits appear to be exceedingly rich in citric acid. Hence we find द्रावी अमृतनायकः सहस्रवेधो वीराम्; I myself having tasted these last I can safely say that these are much more intensely sour than any I have ever tasted Again we find the author of Raj Nighantu gives its locality and name as अमृतवेतस भोटदेशे प्रसिद्ध । Hence considering the Philological, geographical and botanical differentiating principles I am inclined to think this last to be the true अमृतवेतस of the Sanskrit scholars.

Another peculiar substitute which is also very often used instead, is the stalk of some species of the Rheum family. For this we find the following in the Dictionary of Economic Products (1) *Rheumemodi*, Wall—The stalks are eaten by the natives either boiled or in their native state pounded and mixed with salt and pepper. (2) *Rheum nobile*—Hook—The acid stems are eaten both raw and boiled the stalks of *speci forme*, Royle are also similary used.

These most generally grow at altitudes of 10000 feet and upwards and are found almost exclusively in the Himalaya. भोटप्रदेशे प्रसिद्ध of Raj Nighantu may apparently apply to this plant but फलाम् of the same authority would tend to prove otherwise, although चमाङ्गुली शारवाम् would go in its favour. But if it were so the men of the locality where it grows could not have been unconscious of this fact for example the Napalese and others. This perhaps most effectually removes this fact. From the rarity of these plants in Gwalior and from its demand it appears that possibly these are not indigenous to the soil and if it is ever adopted it must have been taken from the Bhotan or Nepal side of the Himalaya thus supporting Raj Nighantu in point of its locality.

वाराहीकन्द ।

हृदिगङ्गे समस्त स्थूलपर्वते उत्पत्तिः । रा ।

वाराही सूकरोकाञ्ची माधवी गृष्टिकाऽपरा ।

गृष्टिर्विषक्सेनकान्ता काष्ठीच वनज्वालिका ॥

तस्याः कन्दोऽपिवक्रालु र्वन्यः श्ववरकन्दकः ।

श्च सकन्द श्ववाराही कन्दसु कच्छपोषमः ॥

कौटिर्मूलक मूलाभः सूकरो वडवानलः ।

वाराहस्य तथाभावे चर्मकारालुको मतः ।

वाराही कन्दसञ्ज्ञस्तु पश्चिमे गृष्टिसंज्ञकः ।

वाराहीकन्द एवान्यै समंकारालुकोमतः ।

अनूपसम्भवेदेशे वाराह इव लोमवान् ॥

विदारो स्वादु कन्दाच्च सातुक्रोष्टी सिताम्भृता ।

इक्षुगन्धा क्षीरवल्ली क्षीरशुक्ला पयस्विनी ॥

वाराहवदना गृष्टिर्वदरो त्यपि कथ्यते । भा ।

विदारो मधुरा स्निग्धा वृंहणी स्तन्यशुक्रदा ॥

शीता स्वर्गाम्रूलाच्च जीवनीवलवर्णादा ।

गुरुपित्रास्त्रपवन दाहान् हन्तिरसायनी ॥ भा ।

From the above it will appear that in Bhabaprokash we have only got a lot of confusion. It would appear as if there are two things, but this is not as we see and all comentators agree with us. To say a thing to be a substitute for one thing and again take the position that one is called the other under certain restrictions clearly shows a confused mind अनूप सन्भवेदेशे वाराह इवलोमवान् is meaningless and is met by the fact that the more authoritative Raj Nighantu lays down इदिगृहे समस्तस्य लूपर्व ते उत्पत्ति. As a matter of fact I have brought samples from Almora which would clearly show वाराह इव लोमवान् The Nepalese are also unanimous in their opinion as regards this. In Nepal and in Kumaon where I have personally inquired about these, there

are two kind of वाराही Called तिलीगंडी । मिठी गंडी From Philological point also it is perfectly easy to deduce गैठी from गृष्टि गृष्टिका Besides the above no other authority has touched the subject in such a curious way. सुश्रुत writes about both the things, but instead of writing one thing just after the other, which that master would certainly have done if one were to be deduced from the other under certain circumstances mentions several other things after विदारौकन्द before he mentions वाराहीकन्द ।

All these things would prove that भावप्रकाश has not done justice to the case.

Besides, the above there are many, and important instances, where similar cases are so frequently observed.

CHAPTER V.

An Appeal.

SECTION 1.

CONCLUSION.

The very meagre account we have been able to give of the manifold uses our forefathers made of the plants of our country in order to minister to the varied wants of life, and of their necessarily thorough knowledge regarding them, is at any rate sufficient to indicate the vast field of Economic Botany which was opened up in Ancient India and which we also may profitably study and utilise in our time. The economic and medical

self-sufficiency of our country in the past cannot but be very encouraging to earnest and devoted workers at present ; and alike in the interests, of our wealth and intellect as of health and culture, it is our duty to restore and encourage the study of the Medicinal Plants of India.

Under the present economic circumstances of our country when we have to be on the look out for the opening up of new careers and means of independent livelihood as well as new channels of industrial and commercial enterprise, we cannot over-estimate the importance of the field of Applied Botany in our country, which in the past had been the basis of its varied economic life by feeding its Agriculture, Pharmacy, and other Manufactures. Some of the old Botanical and allied Industries are still extant ; we have only to revivify them by applying our modern knowledge. In some cases we have to restore old channels now dried up ; and with the patience and application necessary in all inventions and discoveries we may be in a position to create new ones.

Then there is the educational consideration, which also points to the extreme need of general Botanical training as the most effective means of helping the objective study of learners and developing their faculty of observation. And if knowledge is to be estimated by its commercial value we may observe that Botanical Education is also the most paying, for as we have seen it is likely to be in high request in the country, the

industries and occupations of which depend so largely on a knowledge of its Flora and the Botanical resources.

But when we think of Pharmaceutical Botany, we are studying not only an aspect of our economic life, we are concerned not simply with the medical professions and the medicinal drugs, some of the occupations and careers by which men can earn their bread ; but we are concerned with the very conditions of our national health and vigour—the physical basis of our Industrial Efficiency. Ayurvedic Science, the result of investigations into the facts and phenomena of Indian medical system, and just suited to the life, climate, and surroundings of India, necessarily involves the question of our physical stamina and health ; and when these considerations of the effective means of preserving and improving what Frederic List calls the “ Productive Powers and Capabilities ” of our nation are added to these of Production itself *i.e.* of new industrial openings and technical professions, we are forced to the conclusion that this Department of Indian Applied Botany cannot be easily ignored, but must be retained at any cost, modified and improved upon if possible.

Besides the Doctrine of Relativity on which the above conclusion regarding the maintenance of the Indigenous Medical System and the National Medical Science is based, according to which it is the duty of every nation to give full play to its individuality and develop its powers to perfection in every department of human activity, we believe, further that the restoration,

according to modern methods, of the old Indian Learning, the Ayurvedic Theory of Medicine and Treatment of Diseases, is of great interest to theorists and scientists, and of extreme importance to the world which can scarcely afford to lose a type of the systems it has evolved through its history. Ayurveda, thus modernised, would be a contribution to the world's culture and add to its richness and variety.

SECTION 2.

SUGGESTIONS.

It is high time therefore, for the Indian community to (1) institute an inquiry into the ancient literature and traditions on the subject of plants and to report on the modern researches about them ; and (2) to organise a commission of experts to investigate into the history and existing condition of the trades and industries and to suggest lines of industrial enterprise according to modern methods. The country can no longer depend on what individual thinkers and experts are doing out of their own literary curiosity or self interest, though, no doubt, their efforts have suggested the possible directions of activity and the difficulties and failures that are to be guarded against. Time has arrived when responsible leaders should collectively organise all available skill and services and lay the foundations, however humble at the beginning, of Botanical studies and Research Societies of the future. And in the permanent interests of the nation statesmen with long

views should not consider such inquiries and commissions as we suggest to be mere wastes and misapplications of the present national resources. The country expects that men should come forward, who, with the true missionary spirit, can waste their time, energy and money, and wait for the results of their endeavours in the long run. Much will depend upon the industrial, educational and financial idealists of our country.

We offer here a scheme for work that should be taken up just now or in the immediate future, in connection with one at least of the Department of Economic Botany—*viz.* Medical Botany.

1. The starting of factories for the application of Chemistry to the Indian Medicinal Plants with the object of preparing medicines according to the National Medical Science. This is the real Indian Pharmacy ; whereas those workshops and factories which have taken up the preparation of medicines according to the European Pharmacopœia, though they have, no doubt, opened new industrial careers and fields for the investment of National Capital, are really contributing to the foreign system, and cannot by any means be looked upon as national in its proper sense. It is necessary to recognise this distinction at the outset ; for Indian National Pharmacy, while solving, like the other, the economic problem, presents a Medical System that has grown naturally on the Indian soil in harmony with the life of the people.

2. The laying out of Pharmaceutical Gardens for the cultivation of specimens, and the encouragement of Pharmaceutical Agriculture to supply the raw materials for the Pharmaceutical workshops and factories.

3. The foundation of Museums for drugs and specimens of genuine Ayurvedic medicines.

4. The Establishment of Academies and Research Societies—for the identification of, and experiments on plants, the promotion of Pharmaceutical learning in diverse ways, and the study of the commercial aspects of Indian National Pharmacy.

5. The preparation of books in Vernacular for the diffusion of Botanical and Pharmaceutical knowledge among the Sanskrit scholars and the masses.

6. The starting of Ayurvedic Colleges or, at any rate, the opening of new classes for Ayurvedic Education after a stage in which a sufficiently broad basis of general culture through scientific, manual and literary training can be laid. These classes will offer Degree Courses in Ayurveda which will correspond to the higher University courses in the Arts and Science leading to specialisation in the modernised medical science of India.

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Chapter III.—The **Mogul** period (continued) from the reign of Akbar to that of **Aurangzeb.**

Chapter IV.—Later times : conclusion

LIST OF ILLUSTRATIONS.

1. Relief at Borobudur : **Indian adventurers** sailing out to colonise Java.
2. Sculptures from the Sanchi Stupas.
3. The **Royal barge** on the Jagannath Temple, Puri.
4. A **sea-going vessel** from Ajanta paintings.
5. The Royal pleasure-boat from Ajanta Paintings
6. **Landing of Vijaya in Ceylon** (543 B. C.) from Ajanta Paintings.
- 7-12. Indian Adventurers sailing out to colonise Java (from the sculptures of Borobodur)
13. **Andhra ship-coins** of the 2nd century A. D.
14. Some Indian ships and boats of the 17th century.
15. Marhatta Grabs and Gallivats attacking an English ship.
16. Some Indian ships and boats in the earliest part of the 19th century.

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